

**TRIBUTARIES OF THE SANTA YNEZ RIVER  
BELOW BRADBURY DAM**

**Appendix C**

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**SANTA YNEZ RIVER CONSENSUS COMMITTEE**

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**TRIBUTARIES WORK GROUP**

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## **1.1 OBJECTIVES**

The goal of the Santa Ynez River Fish Management Plan (Plan) is to develop and evaluate enhancement actions that will benefit fish and other aquatic resources in the lower Santa Ynez River basin. The lower basin is defined as the watershed and streams west of Cachuma Reservoir (Lake Cachuma), including the mainstem Santa Ynez River below Bradbury Dam and the associated tributaries. Opportunities to enhance conditions in the mainstem Santa Ynez River are limited to a few miles just below Bradbury Dam. Further downstream below Solvang and Buellton, the mainstem has insufficient flow and poor physical habitat conditions for rainbow trout/steelhead. The tributaries on the south side of the lower basin offer better potential for fish habitat than those on the north side. South-side streams originate at fairly high elevations on the cool and well-vegetated north-facing slopes of the Santa Ynez Mountains. Several streams have perennial flow in their upper reaches, although during summer most go dry in their lower reaches in years with average rainfall. By contrast, tributaries on the north side do not retain summer flows and thus, are too dry to support rainbow trout/steelhead. Starting at Bradbury Dam and moving to the ocean, the tributaries of interest include Hilton, Quiota, Alisal, Nojoqui, Salsipuedes, El Jaro and San Miguelito creeks. The tributary reaches in the lower basin fall into four general categories:

- reaches that have good to excellent rainbow trout/steelhead habitat and support existing rainbow trout/steelhead populations;
- reaches that have good to excellent habitat, but do not currently support an anadromous steelhead population because of downstream passage impediments;
- reaches that have fair habitat and with appropriate enhancement efforts or passage impediment removals could support new or larger populations of rainbow trout/steelhead; and
- reaches where conditions are too poor to support rainbow trout/steelhead (*e.g.*, portions of tributaries which go dry or have major passage impediments).

The enhancement objectives of the Santa Ynez River Technical Advisory Committee (SYRTAC) for the tributaries are:

- to protect tributary habitat that is in good condition and which supports fish;
- to enhance aquatic habitat in areas with fair conditions; and
- to enhance fish passage to suitable habitat in tributaries.

## 1.2 APPROACH

Over the past eight years, the SYRTAC has collected detailed data on fish presence and habitat use and on the quality of habitat conditions in the lower Santa Ynez River and tributaries (SYRTAC 1994, 1996, 1997, 1998, 2000). These detailed data, combined with anecdotal observations from long-time residents and other surveys and research (*e.g.*, Harper and Kaufman 1988, ENTRIX 1995, Douglas 1995) provide a good basis on which to identify good rainbow trout/steelhead habitat relative to other areas on the lower Santa Ynez River. Much of the SYRTAC's efforts have focused on identifying and prioritizing the tributaries with regard to their ability to support fish populations, enhancement opportunities and the level of effort required to achieve successful results. This appendix presents our evaluation of each of the tributaries. Our approach in the following sections is as follows.

- *Identify tributaries that currently support fish populations*

We describe each tributary with respect to evidence of rainbow trout/steelhead populations. This includes observations of migrating adults and juveniles, spawning behavior and redds, presence of young-of-the-year, juvenile and adult fish in various months, and the occurrence of potential predators.

- *Describe the current habitat conditions to determine opportunities for protection and enhancement*

For each tributary, we describe the habitat conditions, including factors such as flow, water temperature and quality, riparian canopy, and instream cover. We note those areas that appear to have suitable habitat for supporting fish populations. Where appropriate, we comment on enhancement activities that could improve habitat, and indicate the magnitude of the enhancements that would be required. Finally, we note which areas cannot be improved to support fish. For example, such areas may lack summer flows or may contain permanent passage impediments.

- *Outline potential actions for selected tributaries and reaches*

We discuss the suite of potential actions appropriate for each tributary. Such activities include educating landowners and working with them to establish "fish friendly" conservation land management practices, purchasing conservation easements from willing landowners, enhancing physical stream and riparian habitat, and working with appropriate agencies to remove or modify stream passage impediments such as road crossings and culverts.

- *Prioritize potential actions for selected tributaries and reaches*

For each tributary, we rank potential enhancement actions based on the expected biological benefit, technical feasibility, property access, and cost. Prioritization of actions provides an adaptive management framework for allocating habitat enhancement and restoration resources.

### 1.3 PRIORITIZATION OF ENHANCEMENT ACTIONS

Several actions were identified for improving fish passage and existing habitat conditions within the tributaries below Bradbury Dam. Each enhancement action was evaluated based on the anticipated rainbow trout/steelhead response, and associated biological benefits. Understanding that multiple factors affect the implementation of actions, we conducted a multi-level assessment of the biological benefits, cost, and ease of implementation associated with each action.

Each tributary action was prioritized among all of the potential enhancement opportunities. The ranking of enhancement actions was performed by the Tributaries Work Group, based on a number of variables including the expected biological benefits, project cost, and property access. The results of the ranking are presented in Table 1-1.

We evaluated the existing tributaries for habitat quantity and quality (composition) data, and data pertaining to fish utilization, prior to assessing potential enhancement actions. Since a majority of the tributary streams flow through private land, fish usage and habitat quality data are limited. Where such data are unavailable, qualitative information was provided by the SYRTAC project biologist and other working group members familiar with the lower Santa Ynez River tributaries. The major habitat criteria for rainbow trout/steelhead in the tributaries includes stream gradient, instream cover, canopy cover, proximity to ocean, and available over-summering habitat. The presence of seed populations within each tributary is an important factor in evaluating the anticipated biological response time for each enhancement action. Seed populations are those where rainbow trout/steelhead are present and reproducing, and adequate over-summering habitat is available. In some cases, fish passage impediments may isolate local populations and suppress fish production and expansion due to limited migration opportunities. We determined that tributaries with seed populations present would likely exhibit short-term biological responses associated with modifying passage impediments. Quiota, Alisal, Salsipuedes-El Jaro, and San Miguelito creeks are tributary streams where seed populations currently exist. However, Alisal and San Miguelito creeks have impassable barriers downstream (*e.g.*, Alisal Reservoir, San Miguelito Creek flood control channel) which are infeasible to effectively modify for fish passage. The resident populations found in upper Alisal and San Miguelito are likely residualized strains of rainbow trout/steelhead. The presence of seed populations in Quiota and Salsipuedes-El Jaro creeks suggest that fish passage impediment modifications will improve migration opportunities during both low-flow and high-flow scenarios.

Generally, habitat quality and fish utilization is lacking within the lower reaches of the tributary streams, with the exception of Hilton Creek. Stream gradient was determined to be a major habitat quality component, since fish utilization may be generally greater in higher gradient streams where adequate over-summering habitat is more available (Douglas 1995). The higher gradient reaches identified within the tributaries include Hilton Creek (confluence with mainstem to headwaters), Quiota Creek (middle and upper reaches), Alisal Creek (above Alisal Reservoir), upper Salsipuedes Creek, and San Miguelito Creek (above Lompoc).

**Table 1-1 Tributaries Enhancement Prioritization Ranking Matrix**

Tributary	Tributaries Ranking	Intra-Tributary Ranking	Estimated Length	Estimated Stream Gradient	Over-summering Habitat	Proximity to SYR Mouth	Land Access	Enhancement Opportunity	Distance/Area Enhanced	Expected Steelhead Response Time	Seed Population	Estimated Cost
<i>Lower Hilton Creek</i>	1	1	1,500 ft	HIGH 0.117 (0.117)	YES	6th	Good - BOR	Chute Modification, Supplemental Flow, Channel Extension, Riparian Enhancement	2,800 ft (Chute); 2,980 ft (Flow); 1,215 ft (Extension); 200 ft (Riparian)	Short-term	YES (with watering system)	\$115k (Chute passage); \$360k (Pump & Intake); \$220k (Extension)
<i>Upper Hilton Creek</i>		2	3.5 mi	HIGH 0.081 (0.081)	YES	6th	Good - w/in CalTrans easement; None - adjacent private	Impediment Modification (Hwy 154 Culvert)	18,480 ft (via passage)	Short-term	Uncertain	\$75-100k
<i>Quiota Creek</i>	2	1	6.4 mi	HIGH 0.0585 (Lower 0.059, Upper 0.058)	YES	5th	Poor - Good SB Co. roads, Poor on private adjacent land	Impediment Modification (Arizona Crossings), Livestock Mgmt. & Erosion Control Measures, Riparian Vegetation	24,300 ft (via passage), 5,280 ft (livestock mgmt.)	Short-term	YES	\$150k for 6 crossings (Santa Barbara County Roads has funding for 3 crossings)
<i>Lower Alisal Creek</i>	4	1	3.6 mi	LOW (estimated)	N/A	4th	None - Private adjacent lands	Riparian Enhancement	unknown - depends on access	Long-term	Uncertain	Unknown
<i>Upper Alisal Creek</i>		2	2 mi	HIGH (estimated)	YES (potential)	4th	Poor - Private adjacent lands	Reservoir Passage (ladder)	15,840 ft (via passage)	Short-term	YES	Unknown
<i>Nojoqui Creek</i>	5	1	8 mi	LOW 0.014 (Lower 0.017, Upper 0.011)	NO (low)	3rd	Moderate - Private adjacent lands	Impediment Modification (cascade & culvert)	23,760 ft (via passage)	Long-term	NO	\$30k (passage)
<i>Lower Salsipuedes Creek</i>	2	2	4 mi	LOW 0.003 (0.003)	NO	2nd	Good - CalTrans; Private adjacent lands	Impediment Modification (low-flow impediment), Livestock mgmt. & erosion control measures	Passage to Upper Salsipuedes (5.4 mi) and El Jaro (12 mi); 10,560 ft (livestock mgmt. & erosion control measures)	Long-term	YES	\$50k (passage); \$100-200k? (CEs)
<i>Upper Salsipuedes Creek</i>		3	5 mi	MODERATE 0.033 (Lower 0.017, Upper 0.042)	YES	2nd	Moderate - Private adjacent lands	Livestock mgmt. & erosion control measures	Unknown - depends on access	Long-term	YES	\$200-300k? (CEs)
<i>El Jaro Creek</i>		1	12.5 mi	LOW 0.013 (Lower 0.006, Middle 0.001, Upper 0.017)	YES (potential)	2nd	Moderate - Private adjacent lands	Impediment Modification (low-flow impediment), Livestock mgmt. & erosion control measures	64,240 ft (via passage), 10,560 ft (livestock mgmt. and erosion control measures)	Long-term	YES	\$30k (passage); \$300-400k? (CEs)
<i>San Miguelito Creek</i>	6	1	9 mi	MODERATE 0.022 (Lower 0.002, Middle 0.019, Upper 0.049)	YES	1st	Poor - SB Co. FCD, Unknown/Private lands	Very Limited by Flood Control Channel (3 mi long), other lg. Barriers U/S	Access to upper 6 mi	N/A	YES	N/A

**Stream Gradient** - calculated from 7.5 minute USGS quadrangles (others qualitatively assessed by the Tributaries Working Group)- LOW (0-0.02), Moderate (0.02-0.04), High (0.04+)

**Over-summering Habitat** - presence/absence based on actual observation by SYRTAC, CDFG, etc. unless noted.

**Proximity to SYR Mouth** - based on order of occurrence moving upstream from the lagoon along the mainstem.

**Land Access** - based upon SYRTAC research and interviews.

**Enhancement Opportunity** - based on SYRTAC Biologists' evaluation

**Distance/Area Enhanced** - estimates based on information provided by SYRTAC where possible.

**Expected Steelhead Response Time** - estimates based on qualitative expectations discussed by the Tributaries Working Group. Expectations largely based on stream gradient and presence of seed population.

**Seed Population** - presence/absence of seed population for purposes of recovering/increasing numbers of steelhead; based upon SYRTAC, CDFG, etc. observations.

**Estimated Cost** - based on preliminary estimates by SYRTAC for known enhancement opportunities where available.

Persistent trout populations and associated spawning and rearing habitat have been observed in all of these higher gradient reaches. The reaches in upper Alisal and San Miguelito, however, are occupied by resident trout populations and are isolated from the mainstem by impassable barriers downstream. Nonetheless, successful spawning and rearing have been observed within the lower gradient reaches of Salsipuedes and El Jaro creeks over the past six years.

Another factor limiting fish utilization within the tributary streams is fish passage impediments and barriers. Generally, each tributary has one or more low or high flow fish passage impediment/barrier in its lower reach. Since much of the high quality spawning and rearing habitat is found in the upper reaches, passage is a critical factor to reproductive success.

The proximity of each stream to the Pacific Ocean is also a critical factor for steelhead production. During lower flow years, portions of the mainstem may not be passable, and migrating steelhead may be limited to spawning within tributaries which are connected to the lower mainstem. Access to adequate spawning and rearing habitat within these tributaries is essential during lower flow years.

Finally, as the vast majority of the lower Santa Ynez River and its tributaries lie in private lands, opportunities for habitat enhancement and data collection are necessarily limited by the cooperation and permission of private landowners. Potential tributary actions were ranked by opportunities for access and long-term maintenance of enhancement projects. Lower Hilton Creek (U.S. Bureau of Reclamation property) and portions of Salsipuedes and El Jaro creeks are considered to be accessible for data collection and future habitat enhancements. Currently, reaches on upper Hilton Creek, Quiota Creek, Alisal Creek, Nojoqui Creek, and San Miguelito Creek are generally inaccessible for collecting data and implementing habitat enhancement actions. However, county and state road easements (e.g. Refugio Road crossings on Quiota Creek) are accessible locations where passage impediment modifications may be implemented.

#### **1.4 CONCLUSIONS**

Generally, Hilton Creek, Quiota Creek, and Salsipuedes-El Jaro Creek were identified as the tributaries with the greatest potential for enhancing rainbow trout/steelhead habitat. Conversely, Alisal Creek and San Miguelito Creek are considered low priority because they have large passage barriers. Removal or modification of these impediments is considered infeasible at this time due to jurisdictional issues and cost. Nojoqui Creek is considered a low priority because there is no evidence that rainbow trout/steelhead occupy the stream with regularity, even though the habitat conditions would suggest otherwise.

The tributary action ranking and prioritization is based on our best understanding of rainbow trout/steelhead habitat utilization in the lower Santa Ynez River. We recognize that there are inherent limitations to a numerical ranking system. Continued monitoring of habitat quality and fish utilization will focus on developing a firm understanding of steelhead habitat requirements in Southern California streams. Enhancement actions and their associated priority ranking should

be managed adaptively over time, as new data become available, and funding or property access opportunities materialize. The implementation of enhancement actions should incorporate long-term monitoring elements to evaluate the effectiveness of actions and to measure rainbow trout/steelhead response. These data will become valuable in making future fisheries management decisions in the lower Santa Ynez River tributaries. The Adaptive Management Committee will be responsible for continued monitoring of tributary habitat, assessment of additional enhancement opportunities, and implementation of the recommended actions (see Section 5.7 of the Plan).

## **2.1 OBJECTIVES**

The following sections provide a tributary-by-tributary assessment of the current rainbow trout/steelhead habitat conditions and fish use. These assessments describe the general location, geomorphology, water quality, and habitat conditions of each tributary. They summarize observations of fish use in the tributary. Finally, the enhancement potential of each tributary is outlined.

## **2.2 STEELHEAD LIFE HISTORY AND HABITAT USE**

In the Santa Ynez watershed, adult steelhead migrate from the ocean typically between January and April, depending on the amount of flow in the river. Spawning activities usually occur from February through April, and into May in some years. Upstream migration requires sufficient streamflow to breach the sandbar at the mouth (usually from Salsipuedes Creek runoff) and to allow passage in the river. In dry years, passage can be impeded. Steelhead typically migrate upstream when streamflows rise during a storm event. The eggs are laid in a nest (redd) in gravel. After spawning, adult steelhead may return to the ocean, and again return to the river to spawn in later years.

The young steelhead hatch in approximately six weeks and emerge from the gravels in May and June. Young steelhead may spend one to four years in freshwater before emigrating to the ocean. Typically, however, Southern California steelhead migrate to the ocean as 1 or 2 year olds (5 to 10 inches long). The juvenile outmigration period is typically February through May, but the timing of migration is dependent upon streamflows. Those juveniles that leave the freshwater environment undergo physiological changes that adapt them to a life in saltwater, and become “smolts.” Resident rainbow trout may reach maturity and spawn in their second year of life, although the time of first spawning is generally in their third year. Steelhead may also spawn in their second year, but again it is more common for them to spawn for the first time in their third or fourth year.

## **2.3 TRIBUTARY-BY-TRIBUTARY ASSESSMENT**

The three evaluation criteria for the tributary assessments include: (1) presence or absence of rainbow trout/steelhead; (2) physical habitat conditions including spawning substrate, stream gradient, instream cover, canopy cover, and over-summering habitat; (3) opportunities to maintain or enhance fish habitat. In many cases, access to streams running through private property was not available. In these cases, information may be limited to roadside observations or historical records. Opportunities for implementing enhancement measures will be affected by the willingness of private landowners to participate in these activities.

Fish passage impediments and barriers to upstream migration are described for each tributary in Table 3-1. Where possible, suggestions for improving access to upstream spawning grounds are offered.

### 2.3.1 SURVEY METHODS

This section gives a general overview of the SYRTAC survey methods used in the Santa Ynez River mainstem and lower basin tributaries. Detailed methodologies are available in the SYRTAC compilation reports (*e.g.*, SYRTAC 1996).

#### 2.3.1.1 General Location and Description

Surveys of the Santa Ynez River and lower basin tributaries provide a general description of each creek's topography, major landmarks and passage impediments. Habitat type information for each creek also is presented. Depending on access, habitat surveys estimated percentages of run, riffle, pool and cascade environments, channel width and depth, channel cover, flow levels, substrate characteristics and riparian vegetation quality. All percentages are based on the linear feet surveyed.

#### 2.3.1.2 Fish Use

Since 1993, the SYRTAC has collected information on the presence or absence of rainbow trout/steelhead in the Santa Ynez River and tributaries. Rainbow trout/steelhead presence and overall geographic distribution is documented using direct observation (snorkel surveys), migrant trapping, spawning surveys, and bank observations where access is permitted.

Migrant trapping involves placing a PVC fyke trap across the width of the stream. The purpose is to document the seasonal timing and overall numbers of upstream migrating adults, downstream migrating smolts (juvenile steelhead), and spawned-out downstream migrating adults returning to the ocean. Migrant traps cannot be operated in high flows when steelhead migration is likely highest. Therefore, migrant trapping consistently underestimates the number of migrating fish. Electrofishing is not used in the Santa Ynez system except in sometimes in fish rescue operations, and it is not used to determine the timing of fish entering the system. Migrant trapping is used to determine the timing and numbers of adult and juvenile (smolt) rainbow trout/steelhead migrating into and out of the watershed. Trapped fish are sized, aged, and when possible, sexed. Downstream migrating juvenile rainbow trout/steelhead captured in the migrant traps are inspected for evidence of smolting characteristics (*i.e.*, deciduous scales, silvery appearance, darkened fin margins). Upstream migrating rainbow trout/steelhead are inspected for evidence of ocean residency (*i.e.*, ocean parasites on gills, large size). Table 2-1 provides definitions of different lifestages. Tissue and scale samples are collected for aging purposes and genetic analysis.

**Table 2-1 Definitions and Characteristics of Different Lifestages of Rainbow Trout/Steelhead**

<b>Lifestage</b>	<b>Description</b>
Redd	A nest excavated by a female rainbow trout/steelhead from the stream gravel, containing fertilized eggs and covered with a layer of gravel. Seen as a depression in the stream gravels.
Young-of-the-Year	Juvenile fish hatched in the spring of that year. Size (fork length) < 100 mm
Juvenile	Young fish after its first fall. Fork length 100-200 mm
Adult	Mature fish 2 or more years old. Fork length > 200 mm
Smolt	Juvenile that has undergone physiological changes to adapt to life in saltwater and is migrating from the river to the ocean. Characteristics include deciduous scales, silvery appearance, darkened fin margins.
Ocean Resident	Large size (fork length > 400 mm) and silvery, examination of rings on scales, evidence of ocean parasites on gills.

Snorkel surveys are conducted in the summer and fall in various pool, riffle, and run habitats. The purpose of snorkel surveys is to: (1) determine if rainbow trout/steelhead successfully spawned in that year by looking for young-of-the-year fish, (2) determine the presence or absence of juveniles and/or adults, and (3) determine and document the composition and relative abundance of fish species. Depending on the width of the survey corridor, one or two divers are used to snorkel each habitat. Divers enter the water at the downstream end of the habitat and traverse the unit upstream, counting fish by species and estimating actual size. Depending on water clarity conditions, one or two passes are made with a short (30 minute) interval between each pass.

Spawning surveys are conducted utilizing bank observation techniques. Once a rainbow trout/steelhead redd has been observed, dimensions of the redd are documented along with depth and velocity measurements along the egg deposition area. Flagging with the redd number and date are attached to adjacent vegetation for future monitoring of successful rainbow trout/steelhead production. Roadside observations are conducted only in those areas (mainly along Quiota Creek) where access to the creek is not permitted. During the roadside observations, surveyors enter the creek (directly adjacent to the road) along the Santa Barbara County easement, and visually inspect aquatic habitats for presence of rainbow trout/steelhead and/or spawning activity.

With all fish survey methods, the presence of predatory, competitive and other fish species of interest is noted.

### 2.3.1.3 Water Quality

Water temperature is an important parameter that affects the quality and availability of habitat for rainbow trout/steelhead. Three temperature levels have been used to evaluate habitat conditions within the lower Santa Ynez River. A temperature level of 20°C (68°F) for daily average water temperatures has been used in central and southern California by California Department of Fish and Game (CDFG) to evaluate the suitability of stream temperatures for rainbow trout. This level represents a water temperature below which reasonable growth of rainbow trout may be expected. Data in the literature suggest that temperatures above 21.5°C (71°F) result in no net growth or a loss of condition in rainbow trout (Hokanson *et al.*, 1977). The temperature level of 22°C (71.6°F) daily average temperature was also used to look at relative habitat suitability for sustaining fish. Maximum daily water temperatures ranging between 25°C (incipient lethal temperature [ILT]) and 29.4°C (critical thermal maximum [CTM]) were used to indicate potentially lethal conditions (Raleigh *et al.*, 1984). The ILT indicates potentially lethal conditions due to rather abrupt change in temperature while the CTM describes a potentially lethal condition due to slow, incremental increase in temperature. These temperature levels serve as guidelines to indicate general seasonal and spatial trends where water quality conditions may be a concern, but the levels were not used to rule out particular reaches. Cool water refuges in deep pools or pools with upwelling (*i.e.*, circulation of cooler, deeper water from the bottom of the pool) are available to varying degrees along the mainstem and some tributaries. See Appendix G for a more detailed discussion of the effects of temperature on rainbow trout/ steelhead.

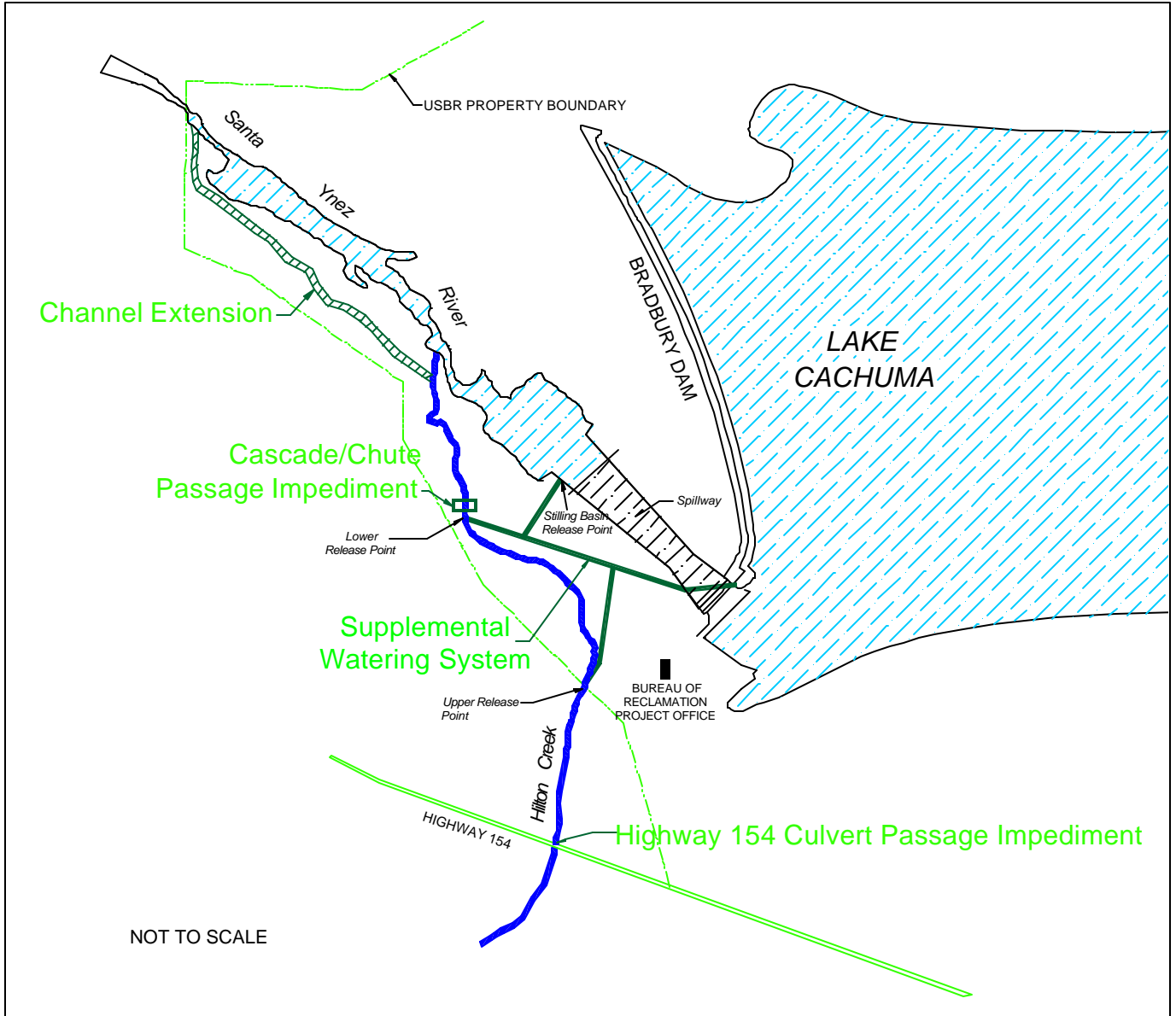
Depending on stream access, water quality observations include temperature and flow measurements. Qualitative assessments of water quality include flow conditions, presence of cattle fecal material, water clarity and general degradation of water quality.

### 2.3.2 HILTON CREEK

#### 2.3.2.1 General Location and Description

Hilton Creek is a small tributary located immediately downstream of Bradbury Dam that has intermittent or no flows in its lower reaches during the dry season. The estimated watershed area is approximately 4 square miles. About 2,980 feet of Hilton Creek is on U.S. Bureau of Reclamation (Reclamation) property, including the confluence with the Santa Ynez River. Figure 2-1 presents a schematic diagram of Hilton Creek, including a map of the recommended enhancement actions for Hilton Creek. Figure 2-2 provides a summary of Hilton Creek habitat quality and fish utilization attributes.

The lower reach of Hilton Creek is high gradient and well confined. Riparian vegetation and the walls of the incised channel shade the streambed. A rocky cascade and bedrock chute are passage impediments for migrating steelhead, located about 1,380 feet upstream from the confluence with the river. The cascade is approximately 6 feet high. A shallow pool (the “chute



**Figure 2-1 Hilton Creek Enhancement Projects**

## QUICK FACTS

### Hilton Creek

Number of *O. mykiss* Observed (1995-1999)

**Present to Common** (1,496 in 1995-1999 surveys-1,429 YOY, 38 JUV 34 ADULT; trapping in 1995, 1997, 1998 yielded 68 U/S migrants and 17 D/

Estimated Watershed Area

**4 sq. mi.**

Estimated Stream Length

**3.8 miles** (Lower-0.3 mi., Upper-3.5 mi.)

Estimated Stream Gradient

**HIGH** (Lower-11.7%, Upper-8.1%)

Percent Canopy (Avg)

**1 to 25** (Range: 0 to 100; many with 0)

Total Distance Habitat Typed (ft)

**2,935** (Access above BOR land is restricted by private property)

## Summary of Habitat Attributes Hilton Creek (Lower)

	Pool	Riffle	Run
Quantity	11	25	20
Distance (ft)	295.5	1764	875
Distance (%)	10.1	60.1	29.8
Avg Depth (ft)	1.7	0.7	0.9
Avg Max. Depth (ft)	2.6	1.2	1.4
Avg Instream Shelter (%)	50 to 75	25 to 75	25 to 75
Avg Canopy (%)	25 to 75	0 to 100	0 to 100
Dominant Shelter Components	Boulders and whitewater elements; aquatic and terrestrial vegetation, bedrock ledges, lg. woody debris	Whitewater and boulders; some aquatic and terrestrial vegetation, bedrock ledges, sm. woody debris	Boulders and whitewater; some bedrock ledges, aquatic and terrestrial vegetation, sm. woody debris

### Temperature Data

(Lower Hilton Ck. only)

Year	Ave. Daily Mean	Days Exceed 20°C	Daily Max.	Days Exceed 25°C
<b>Lower Hilton (near SYR confluence)</b>				
1995	17.8	33	26.3	5
1996	13.8	0	20.7	0
1997	14.5	0	16.6	0
1998	15.7	30	25.7	14
<b>Lower Hilton (below cascade/chute)</b>				
1995	16.8	2	24.3	0
1997	15.8	0	18.5	0
1998	16.0	14	27.7	19
<b>Mid-Hilton (upstream Reclamation property line)</b>				
1998	16.3	0	21.1	0
1999	16.5	21	28.7	11

Lower (near confluence) monitoring conducted in 1995 (April thru August), 1996 (March to mid-June), 1997 (April to mid-July), 1998 (March to October).

Lower (below cascade/chute) monitoring conducted in 1995 (May thru August), 1997 (mid-August to mid-September), 1998 (April to August).

Mid (Reclamation boundary) monitoring conducted in 1998 (mid-June to mid-October), 1999 (mid-June to mid-November).

### LOWER HILTON CREEK PERCENT HABITAT TYPE (linear feet)

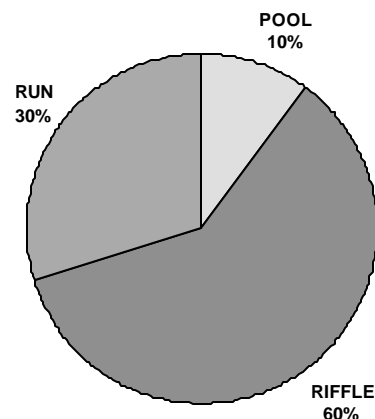


Figure 2-2 Summary of Hilton Creek Habitat Attributes

pool”) is at the base of the cascade. The bedrock chute immediately above it is about 140 feet long. Passage can be difficult here during high velocity flows due to the lack of deeper water and resting sites.

Habitat mapping in 1995 classified the stream below the chute pool as 44% run, 27% riffle, 26% pool, and 3% cascade (SYRTAC 1997). Channel width averaged 9.3 feet, and maximum pool depth averaged 3 feet. Most pools had suitable spawning habitat at their tails. High flows in the winter of 1998 altered the lower few hundred feet of channel and moved the confluence with the Santa Ynez River further downstream. In 1998, habitat mapping was conducted on the portion of the creek on Reclamation property. Flow during this survey was 2.7 cubic-feet-per-second (cfs) to 2.8 cfs. The lower creek, up to the chute pool (1,382 feet), was comprised of 58% riffle/cascade, 27% run, and 15% pool.

Habitat surveys in 1998 above the chute pool to the Reclamation property boundary (1,553 feet total) documented 61% riffle/cascade, 34% run, and 5% pool (SYRTAC 1998 data). The reach just above the bedrock chute (about 300 feet) is consecutive run/riffle habitat with little or no canopy cover. Above this open reach to the Highway 154 Culvert (about 2,400 feet total), habitat conditions are good to excellent with excellent riparian shading and cover. Pool habitat is greater than those in the lower Hilton (> 26%) and old growth sycamore dominate the vegetation providing dense canopy cover. Streamflows persist longer in this reach than farther downstream. Stream gradient increases to greater than 5% from the Reclamation property boundary to approximately .5 miles upstream of the Highway 154 Culvert. About 1,200 feet of this habitat is on Reclamation property. The Highway 154 Culvert is a complete passage barrier and is located about 4,200 feet upstream from the confluence and about 1,200 feet upstream from the Reclamation property boundary.

#### **2.3.2.2 Fish Use**

In general, steelhead are known to migrate to the uppermost accessible reaches in a river, seeking spawning habitat. Adults migrating up the Santa Ynez River are blocked by Bradbury Dam and must find spawning habitat downstream of the dam. Hilton Creek currently provides the most upstream spawning habitat available to anadromous fish in the lower Santa Ynez basin.

Hilton Creek is inhabited by rainbow trout/steelhead up to the chute pool (1,380 feet upstream) and prickly sculpin (to about 800 feet upstream from the confluence). Sculpin cannot negotiate a small bedrock cascade and are not present in the upper portions of the creek. No introduced warmwater species, such as bass, bullhead or sunfish, are found in Hilton Creek.

Adult passage to upper Hilton Creek is hampered first at a cascade and bedrock chute (located about 1,380 feet upstream from the confluence with the Santa Ynez River) and then completely blocked at a culvert at the Highway 154 crossing (about 4,200 feet upstream from the confluence). Spawning is generally more common in the upper sections of the lower reach. No spawning or young-of-the-year have been observed above the cascade to the Reclamation property boundary (about 2,980 feet upstream from the mainstem). Anecdotal reports indicate

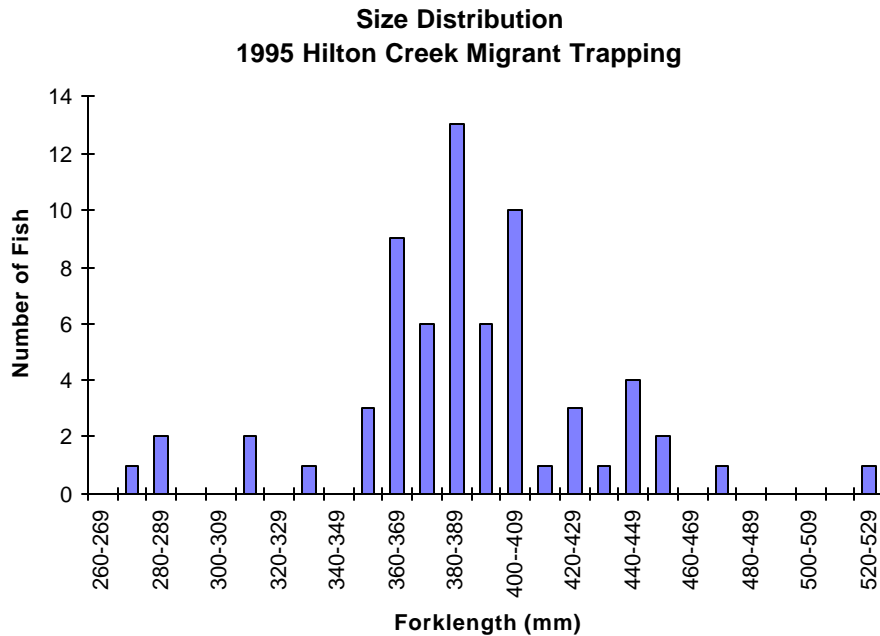
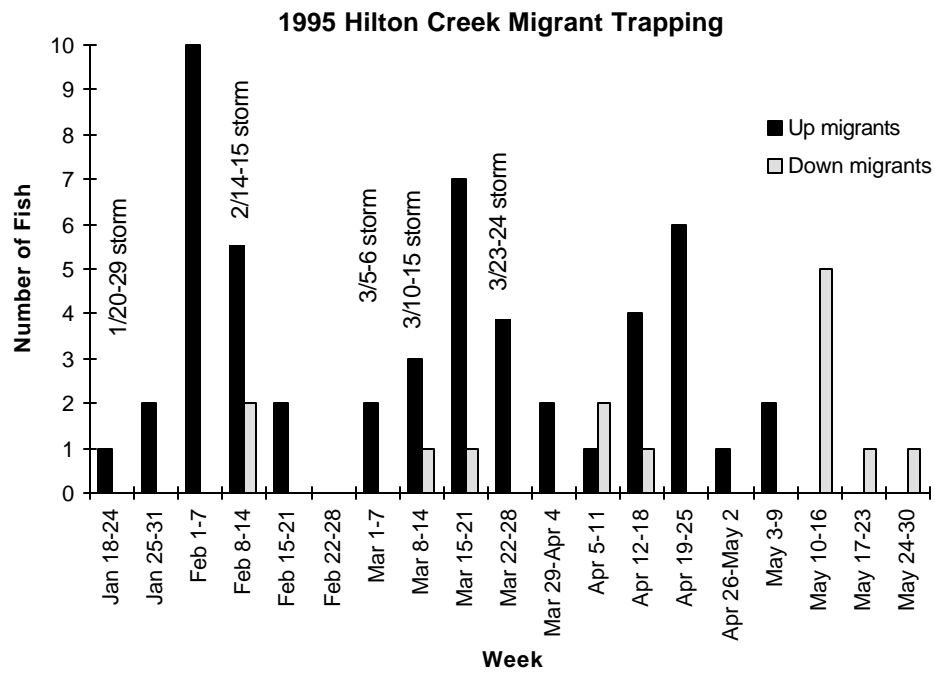
that historically trout were present in upper Hilton Creek above the Highway 154 Culvert prior to the Refugio Fire. It is possible that the 1955 Refugio fire, which burned 84,700 acres, decimated the trout population in this upper reach.

Adult rainbow trout/steelhead have been documented migrating into Hilton Creek in all years that observations have been made, but numbers were low in years with low winter runoff. Migrant trapping captured 2 adults in 1994, 52 in 1995 during the wet winter, 3 adults in February 1996 when the creek briefly flowed, 10 adults in January 1997 before flows declined, and several during abbreviated trapping in 1998 and 1999 (SYRTAC 1997, 1998, 2000). Actual spawning with production of young-of-the-year was documented in 1995, 1997, and 1998. Production has been especially good during high runoff years such as 1995 and 1998, when many adults enter the creek. In 1995, migrant traps captured 52 adults between January 16 and April 17, and the actual numbers were likely higher since the trap is inoperable at high flows (no trapping on 21 of 93 days) (Figure 2-3). Four upstream migrating adults were captured in 1998, while no migrants were captured in 1999. Between 1994 and 1999, 71 adult migrant trout were captured in Hilton Creek. Adults migrating into Hilton Creek are often large and could be anadromous steelhead from the ocean (particularly in wet years), rainbow trout that spilled over from Lake Cachuma, or fish that are resident in the river, its tributaries or the lagoon (SYRTAC 1997, 1998, 2000).

Young steelhead remain in fresh water for a year or more. Because the stream goes dry during the summer, young-of-the-year cannot complete rearing in lower Hilton Creek under natural conditions (SYRTAC 1997, 1998, 2000). The fish are either stranded or must enter the mainstem where the likelihood of predation by bass and catfish increases. Fish rescue operations were conducted in 1995 and 1998 to move young-of-the-year from the drying stream to better habitat. Between July 21 and August 4, 1995 approximately 100 young-of-the-year were rescued and relocated to the portion of the mainstem between the spill basin and the Long Pool. On August 5, 1995, over 120 young-of-the-year and five adults were rescued and relocated. In June 1998, 831 young-of-the-year (up to 100 mm) and three adults were captured in 1,200 linear feet of stream (Reclamation 1998). No juveniles were observed in the creek. Many young-of-the-year and all three adults were found below the pool area just below the cascade. The remaining young-of-the-year were removed from the lower reach of the creek. In the spring of 2000, the supplemental watering system provided consistent, cool water flow from Lake Cachuma to support newly hatched young-of-the-year.

### **2.3.2.3 Water Quality**

Water temperatures have been monitored in the lower reach (about 250 feet upstream of the confluence) and the middle reach in a pool downstream of the chute pool (about 1,000 feet upstream of the confluence) since 1995. Beginning in 1998, temperatures at the Reclamation property boundary (2,980 feet upstream of the confluence) have also been monitored. Hilton Creek flows are very sporadic and highly dependent on seasonal rainfall. During dry and sometimes average years, the creek may only flow for short periods of time before losing



**Figure 2-3 Seasonal Trapping Results in Hilton Creek (1995)**

continuity with the mainstem. During wet years, the creek typically flows until late May, sometimes later depending on runoff (June 1995, July 1998). Thermograph data, coupled with observations throughout the year, indicate that water temperatures, while probably not preferred, are generally suitable for rearing through the entire year. Water temperatures are lowest at the upper Reclamation property boundary, with gradual warming down to the mouth of the creek. Summer water temperatures at the chute pool (1,380 feet upstream of the confluence) are substantially lower than those measured further downstream. Water temperatures in the chute pool may be suitable through at least August, although the pool would be physically isolated from other areas of potential habitat during a portion of the year. Seasonal patterns in surface flows and the persistence of pools vary annually depending on precipitation and runoff within the watershed.

Maximum water temperatures within Hilton Creek, 250 feet upstream of the confluence with the mainstem, ranged from 16.4 to 26.3°C during the summer of 1995 (June through August). Young-of-the-year rainbow trout/steelhead were observed to be generally healthy and actively feeding at temperatures up to 25.8°C. Young-of-the-year rainbow trout/steelhead were observed up to the fish rescue operations in July 1995. Daily maximum water temperatures exceeded 25°C for rainbow trout/steelhead for a few days in early August 1995.

In 1997, the year a temporary watering system was installed at Hilton Creek, maximum water temperatures measured 250 feet upstream of the mouth never exceeded 18°C during the spring and summer (April to October). Temperatures at the upstream monitoring locations were slightly cooler during this period.

In 1998, summer water temperatures measured at the Reclamation property boundary (2,975 feet upstream of the confluence with the mainstem) were substantially lower than those measured further downstream. Comparison of 1998 thermograph data at the lower two monitoring sites (1,000 feet and 250 feet upstream of the mainstem) indicated that average water temperatures were the same or 1 to 2°C warmer at the lower sites. Maximum water temperatures were sometimes 2 to 4°C at the lower monitoring sites. In this year, flow in the lower creek ceased by July 31. Maximum water temperatures during the last half of July did exceed 25°C at this location. Flow was measured and visually estimated to be less than 1 cfs when water temperatures were exceeding 25°C. Water temperatures at the chute pool exceeded 25°C for only approximately two weeks around late July and early August.

Dissolved oxygen concentrations are within the normal tolerances when water is flowing in the creek (> 5 ppm). Once the creek becomes intermittent, pool water quality can diminish to near anoxic conditions. Channel disturbance and water quality problems appear minimal. Hilton Creek clears rapidly after storm events, usually within a few days after rains have ceased.

#### **2.3.2.4 Enhancement Potential**

Hilton Creek has the best potential for enhancement of all the tributaries due to its proximity to a dependable water supply (Lake Cachuma), high gradient orientation, presence of spawning and

rearing rainbow trout/steelhead, its good shading conditions and substrate and channel structure, and its presence on Reclamation property. Providing summer flows would allow fish of all age classes (young-of-the-year, juvenile and adult) to rear and over-summer in Hilton Creek. Enhancing or extending the channel near the confluence would extend the benefits of any supplemented flows. Planned modification of the impediment at the chute pool and chute area will open up additional habitat while riparian enhancement upstream of the impediment will help reduce summer water temperatures. Modification of the Highway 154 Culvert would provide passage to an additional mile or more of upstream spawning and rearing habitat. Habitat modifications for Hilton Creek are discussed further in Appendix D.

The enhancement actions identified for Hilton Creek, include bedrock chute/cascade and Highway 154 Culvert modifications, and the proposed creation of additional spawning and rearing habitat via extending the channel near its confluence with the mainstem Santa Ynez River. Tributary actions for Hilton Creek were ranked (No. 1) as the highest priority, particularly the actions involving passage impediment modification at the chute pool and Highway 154 Culvert. The channel extension has the potential to provide valuable additional summer rearing habitat; however, opportunities to provide/improve access to existing habitat in Hilton Creek (and other tributaries) are considered a higher priority.

### 2.3.3 QUIOTA CREEK

#### 2.3.3.1 General Location and Description

Quiota Creek enters the Santa Ynez River between the towns of Solvang and Santa Ynez. Quiota Creek is estimated to be 6.4 miles long and is a relatively high gradient stream. The Quiota Creek watershed area is approximately 6.3 square miles. Figure 2-4 provides a summary of Quiota Creek habitat quality and fish utilization attributes. Studies are limited due to lack of access on private property. Surveys of lower Quiota Creek in spring 1994 found little flowing water and degraded habitat conditions (ENTRIX 1995, SYRTAC 1997). Oaks and willows generally were abundant, although riparian vegetation was lacking in many places. Silt was the predominant substrate, especially in pools. Summer flow appears to be intermittent in average and dry years in the lower section. Grazing decreased the amount of streamside vegetation in this area.

A total of 602 linear feet of accessible Quiota Creek was habitat typed by the SYRTAC biologist, where habitat composition is 32% pool, 19% riffle, 52% run, and 15% glide. Refugio Road crosses Quiota Creek nine times starting with several crossings 1.3 to 1.6 miles from the mainstem Santa Ynez. In 1998, a survey was conducted from road crossings about 1.5 to 3 miles upstream from the confluence. Habitat conditions in this area are better than in the lower reach, particularly after the storms of 1998. Good canopy conditions provide shading within this section. Additionally, pool habitats have good depth and complexity of instream cover. Numerous undercut banks exist (particularly in pools) providing excellent rearing habitat. In contrast to several other tributaries, substrate is composed of larger size gravel, cobbles, and

## QUICK FACTS

### Quiota Creek

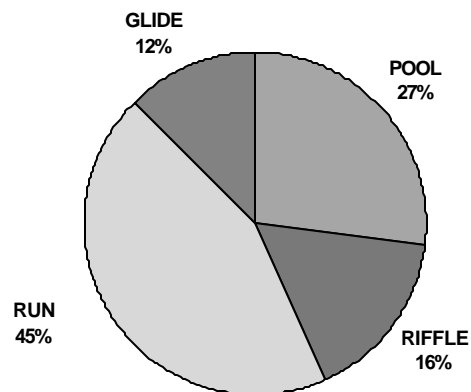
Number of <i>O. mykiss</i> Observed (1995-1999)	<b>Generally Common</b> (No sampling or trapping conducted 1995-1999; based on bank observations at selected crossings)
Estimated Watershed Area	<b>6.32 sq. mi.</b>
Estimated Stream Length	<b>6.4 miles</b>
Estimated Stream Gradient	<b>HIGH</b> (5.9%)
Percent Canopy (Avg)	<b>50</b> (Range: 25 to 75)
Total Distance Habitat Typed (ft)	<b>602</b> (not fully surveyed due to private property access)

## Summary of Habitat Attributes

### Quiota Creek

	Pool	Riffle	Run	Glide
Quantity	5	3	5	1
Distance (ft)	192	115	315	88
Distance (%)	31.9	19.1	52.3	14.6
Avg Depth (ft)	1.5	0.36	0.61	0.38
Avg Max. Depth (ft)	2.6	0.85	1	0.8
Avg Instream Shelter (%)	25 to 50	75	25 to 75	75
Avg Canopy (%)	25 to 100	75 to 100	50 to 100	100
Dominant Shelter Components	Boulders, bedrock ledges, root masses; some undercut banks, sm. woody debris and aquatic vegetation	Root masses and boulders; some sm. & lg. woody debris, and terrestrial vegetation	Root masses, terrestrial vegetation, undercut banks, and terrestrial vegetation	Sm. woody debris, root masses, and terrestrial/aquatic vegetation

QUIOTA CREEK  
PERCENT HABITAT TYPE  
(linear feet)



#### Temperature Data

No water quality monitoring conducted during the survey period.

Figure 2-4 Summary of Quiota Creek Habitat Attributes

boulders. An unnamed tributary that enters Quiota Creek about 4 miles upstream from the Santa Ynez confluence was examined in August 1994 (ENTRIX 1995). The tributary was spring-fed and in a steep gully. There was little or no flowing water in late summer, and upwelling (cooler water circulating upward from the bottom of the pool) produced most habitats. In some places, there was good boulder cover and adequate pool depths that provided refuge for over-summering rainbow trout/steelhead. Oaks and cottonwoods shaded a significant portion of the creek, but overall there was little riparian vegetation.

The numerous road crossings of Refugio Road are impediments to upstream passage at low and high flows (S. Engblom, pers. comm., 1999). All nine crossings are shallow-water Arizona crossings with concrete beds and, at several sites, a 2- to 3-foot drop downstream of the concrete apron. Four of these crossings warrant further attention for passage enhancement. The County of Santa Barbara maintains Refugio Road.

The road crossings intersecting Quiota Creek were evaluated by the SYRTAC project biologist and ranked for fish passage-associated modifications (S. Engblom, pers. comm., 2000.) The County of Santa Barbara has indicated that three crossings (Crossings No. 2, 5, 8) will be repaired in the near future, incorporating fish-friendly engineering advocated by SYRTAC. The remaining road crossings have been ranked as high priority implementation actions by the work group. Table 2-2 depicts the ranking order and important site elements, for each road crossing.

#### **2.3.3.2 Fish Use**

Visual surveys conducted by DFG from 1993 to 1998 and roadside surveys by SYRTAC biologists (1993 to 2000) show that Quiota Creek, especially the upper reach, supports rainbow trout/steelhead. Although a May 1994 walking survey (visual inspection) reported no fish, electrofishing of 125 feet captured three young-of-the-year, six juvenile and four small adult rainbow trout/steelhead. Visual observations at that time also documented over 100 young-of-the-year (SYRTAC 1997). In an unnamed tributary about 4 miles upstream from the Santa Ynez River, an August 1994 survey documented over 100 young-of-the-year and 20 to 30 juvenile/adults (SYRTAC 1997). A visual survey in February 1995 documented spawning activity, redds and two adults (one 16-inch female and 6-to 8-inch male) approximately 2 miles upstream of the confluence with the Santa Ynez River (SYRTAC 1997). Observations from nine road crossings in late 1998 documented approximately 100 young-of-the-year from about 1.5 to 3 miles.

#### **2.3.3.3 Water Quality**

No temperature monitoring has been conducted on this stream. In the lower reach, lack of good shading suggests that warming may be a problem. Cattle fecal material was also observed in and around the stream in this area which may contribute to nutrient loading. Shading is better upstream, which may indicate that better water temperature could be found there.

**Table 2-2 Quiota Creek Road Crossings Passage Impediment Modification Rankings**

<b>Road Crossing</b>	<b>Passage Barrier Type</b>	<b>Jump Height</b>	<b>Important Elements</b>	<b>Ranking</b>
<b>No. 1</b>	Low Flow	2 ft.	Shallow downstream (D/S) pool Shallow flow over road	<b>5</b>
<b>No. 2</b>	Low/High Flow	4 ft.	Lg. D/S pool (over-summering) Shallow/high velocity flow over road	<b>1</b> (slated for SB Co. repair)
<b>No. 3</b>	Low Flow	2 ft.	D/S pool present Shallow flow over road	<b>6</b>
<b>No. 4</b>	Low Flow	3 ft.	D/S pool present Shallow flow over road	<b>4</b>
<b>No. 5</b>	Low Flow	< 1 ft.	D/S pool present Shallow flow over road	<b>7</b> (slated for SB Co. repair)
<b>No. 6</b>	Low/High Flow	4 ft.	Pool absent D/S (riffle)	<b>2</b>
<b>No. 7</b>	Low/High Flow	< 1 ft.	Velocity impediment (culvert)	<b>8</b>
<b>No. 8</b>	N/A	N/A	Road washed out	<b>9</b> (slated for SB Co. repair)
<b>No. 9</b>	Low/High Flow	4 ft.	Sm. Shallow pool D/S Shallow flow over road	<b>3</b>

#### **2.3.3.4 Enhancement Potential**

The upper reaches and tributaries of Quiota Creek provide good habitat potential based on observations of fish production in limited surveys. Passage at several road crossings could be improved to provide steelhead better access to these reaches. The lower reach of Quiota Creek, close to the Santa Ynez River, has low potential as fish habitat due to a lack of flow during the summer months. This characteristic is common in the lowermost reaches of many tributaries in the Santa Ynez system. Stream reaches with persistent flow in the lower portion of the creek may benefit from improvements to riparian vegetation and livestock management.

The enhancement actions analyzed for Quiota Creek were ranked as high priority (Rank No. 2). The tributary actions identified for Quiota Creek include road crossing (fish passage impediments) modifications and improving instream and riparian habitat. The modification of nine road crossings (Refugio Road) which currently impede fish passage during low and high-flows was ranked as high priority due to the presence of a seed population, over-summering habitat, and the anticipated short-term biological response time. The County of Santa Barbara, which maintains Refugio Road, has expressed interest in modifying three of the crossings with fish-friendly engineering elements, and will also work in concert with the Adaptive Management Committee to improve the remaining six crossings. Improvement of degraded stream habitat near the confluence with the mainstem through livestock management is of lower priority since property access is not currently available, and this reach does not exhibit perennial flow.

#### **2.3.4 ALISAL CREEK**

##### **2.3.4.1 General Location and Description**

Alisal Creek enters the Santa Ynez River near Solvang. Alisal Creek is approximately 5.6 miles long and its watershed area is approximately 11.6 square miles. Stream gradient in Alisal Creek is low below the reservoir and high in the stream upstream of the reservoir. Figure 2-5 provides a summary of Alisal Creek habitat quality and fish utilization attributes. Habitat in lower Alisal Creek runs through private property and was not surveyed, although some observations were made from the road. During the summer, flow does not reach the Santa Ynez River confluence, but little is known about water conditions further upstream. Access to Alisal Creek was granted in 1995 and riparian and instream habitat is similar to that of upper Quiota Creek. The lower creek runs through a golf course. A small concrete structure just upstream of the confluence was a potential passage impediment, but it was washed out by storms in 1995. A dam and small reservoir (Alisal Reservoir) exist about 3.6 miles upstream from the confluence and block passage for steelhead to upstream areas. Approximately 2 miles of Alisal Creek flows above the Alisal Reservoir. Conditions below this reservoir appear fair, with good riparian vegetation and canopy cover. The habitat above the reservoir is very good with excellent riparian vegetation and canopy, and has perennial flow.

## QUICK FACTS

### Alisal Creek

Number of <i>O. mykiss</i> Observed (1995-1999)	<b>Present, but in low numbers</b> (Based on bank observations. No sampling conducted in 1996-1999 due to access; trapping in 1995 yielded 2 U/S migrants. Common above reservoir.)
Estimated Watershed Area	<b>11.6 sq. mi.</b>
Estimated Stream Length	<b>5.6 miles</b> (Below reservoir-3.6 mi.; Above reservoir-2 mi.)
Estimated Stream Gradient	<b>MODERATE</b> (Below reservoir-Low; Above reservoir-High)
Estimated Canopy	<b>GOOD</b> (excellent above reservoir)
Total Distance Habitat Typed (ft)	<b>0</b> (not habitat typed due to private property access)

## Summary of Habitat Attributes

### Alisal Creek

- Alisal Reservoir dam blocks fish passage to upper Alisal Creek.
- Habitat conditions below reservoir are fair with little dry season flow.
- Habitat conditions above reservoir are very good above reservoir with perennial flow.
- Resident rainbow trout spawn and rear in the upper creek and have been observed to be common to abundant.
- Below reservoir oversummering habitat is poor due to low flow.
- Habitat conditions and fish utilization below reservoir have not been assessed due to private property access.
- No water quality (temperature & DO) monitoring conducted during the survey period.

ALISAL CREEK  
PERCENT HABITAT TYPE  
(linear feet)

No Quantitative Data Available

Figure 2-5 Summary of Alisal Creek Habitat Attributes

#### **2.3.4.2 Fish Use**

Fish surveys were conducted in February 1995, when access to the property was available for migrant trapping and an electrofishing survey (SYRTAC 1997). Prior to 1995, migration into Alisal Creek was blocked by a concrete drop structure and apron. This structure was washed away by high flows in early 1995, and rainbow trout/steelhead were subsequently captured in the lower creek. Twenty resident rainbow trout juveniles and adults (78 mm to 235 mm fork length) were found via electrofishing in Alisal Creek upstream of Alisal Reservoir (SYRTAC 1997). Bass and sunfish inhabit the reservoir. Trapping in lower Alisal Creek in January 1995 captured two adult rainbow trout/steelhead migrating upstream into the creek. Many other rainbow trout/steelhead of various size classes were observed to be common to abundant within the upper portions of Alisal Creek (S. Engblom, pers. comm., 1999).

#### **2.3.4.3 Water Quality**

No temperature monitoring has been conducted, but observations suggest good temperature conditions in upper Alisal Creek.

#### **2.3.4.4 Enhancement Potential**

More information is needed about this tributary to evaluate enhancement potential. Depending on water availability and channel conditions downstream of the reservoir, enhancement measures could be useful to improve spawning and rearing opportunities. Providing fish passage opportunities above the Alisal Reservoir is extremely limited due to the size of the dam and reservoir and private property access. The cost and technical feasibility of such an effort would require significant resources.

Since enhancement opportunities are limited to improving habitat downstream of Alisal Reservoir, and private property access is unlikely, tributary actions on Alisal Creek are considered to be low priority (Ranking No. 4). Improvement of spawning and rearing habitat within lower Alisal Creek could be beneficial to rainbow trout/steelhead, however, the dominant proportion of good habitat exists above Alisal Reservoir.

### **2.3.5 NOJOQUI CREEK**

#### **2.3.5.1 General Location and Description**

Nojoqui Creek joins the Santa Ynez River near Buellton. Nojoqui Creek is estimated to be 8 miles long, and its watershed area is approximately 15 square miles. Nojoqui Creek is predominantly a low gradient stream. Figure 2-6 provides a summary of Nojoqui Creek habitat quality and fish utilization attributes. Habitat surveys were conducted in 1994 and 1998. The lower reach of Nojoqui Creek from the confluence with the mainstem Santa Ynez River up to a 1/2 to 3/4 miles had degraded conditions with no canopy, little vegetation, eroded banks, and little or no flow during summer. Further upstream, however, conditions appeared good for spawning and rearing, although flow is fragmented and intermittent within this section,

particularly during average and dry years. The stream had dense riparian vegetation and canopy cover, good instream cover from boulders, roots, and undercut banks. The 1998 habitat survey found mainly shallow runs (65% run), 15% riffle, 17% glide, and 4% pool.

No significant passage impediments currently exist. One low-flow impediment exist approximately 3 miles upstream from the Santa Ynez River, and another impediment may exist at a culvert under the Highway 101 Bridge. The second possible impediment has not yet been evaluated. A small concrete dam that impeded passage washed out in 1995.

#### **2.3.5.2 Fish Use**

Electrofishing and snorkel surveys in May 1994 found arroyo chub and threespine stickleback abundant in Nojoqui Creek, with small populations of green sunfish and largemouth bass in a few pools. However, no rainbow trout/steelhead were observed or captured. Two adults were captured migrating upstream in March 1998 and another adult observed in a pool, but no other rainbow trout/steelhead were captured in 1995 or 1997. Anecdotal reports from local residents are conflicting, with one resident reporting that steelhead never really used Nojoqui (J.J. Hollister, pers. comm., 1998 to M. Cardenas) and another reporting that steelhead trout were common in the creek (Jack Daniels, pers. comm.). Based on the size of the historical run, there is little doubt that steelhead historically utilized Nojoqui Creek from time to time. It is speculated that, unlike the other creeks in the lower basin, Nojoqui does not have a remnant population within its watershed. Land use activities, coupled with the recent drought effectively dried Nojoqui Creek for several years during the late 1980's and early 1990's. With no remnant seed population within the creek, very small numbers of adults returning from the ocean, and low numbers within the Santa Ynez watershed, it is highly unlikely that Nojoqui Creek could become populated with rainbow trout/steelhead in the near future.

#### **2.3.5.3 Water Quality**

Summer water temperatures sometimes exceeded guidelines for rainbow trout/steelhead (20°C daily mean and 24°C maximum); although, in general, water temperatures tend to remain cool.

#### **2.3.5.4 Enhancement Potential**

Rainbow trout/steelhead are rarely present in Nojoqui Creek, despite what appears to be suitable habitat and cooler summer water temperatures. In addition to poor habitat condition during the recent drought, there may be some as yet undocumented passage impediments located on private property. The area near the confluence is somewhat degraded. Lack of summer flows in the lower reaches results in a loss of continuity with the mainstem during early spring and summer, although isolated areas of flow and pool Management Committee. Since documented steelhead use within Nojoqui Creek is limited, habitat enhancement is of lower priority (Ranking No. 5).

## QUICK FACTS

### Nojoqui Creek

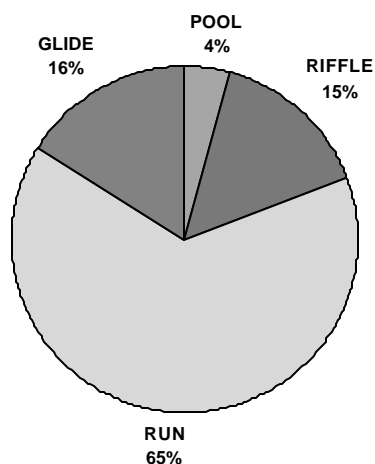
Number of <i>O. mykiss</i> Observed (1995-1999)	<b>Generally Absent</b> (1 Adult Observed in 1998 survey; 1998 trapping yielded 2 U/S mirarants and 1 D/S mirarant)
Estimated Watershed Area	<b>15.1 sq. mi.</b>
Estimated Stream Length	<b>8 miles</b>
Estimated Stream Gradient	<b>LOW</b> (1.4%)
Percent Canopy (Avg)	<b>1 to 50</b> (Range: 0 to 100)
Total Distance Habitat Typed (ft)	<b>16,382</b>

## Summary of Habitat Attributes

### Nojoqui Creek

	Pool	Riffle	Run	Glide
Quantity	14	34	42	15
Distance (ft)	670	2478	10620	2614
Distance (%)	4.1	15.1	64.8	16
Avg Depth (ft)	2.3	0.7	1	1.2
Avg Max. Depth (ft)	3.5	1.3	2	2.3
Avg Instream Shelter (%)	0 to 100	25 to 100	50 to 75	25 to 50
Avg Canopy (%)	0 to 50	0 to 75	0 to 50	0 to 50
Dominant Shelter Components	Aquatic vegetation (lower) and root masses, boulders, terrestrial vegetation, undercut banks (upper); sm. & lg. woody debris	Whitewater, aquatic vegetation (lower), boulders (upper); terrestrial vegetation	Aquatic vegetation (lower/upper) and boulders, terrestrial vegetation (upper); lg. woody debris and root masses (upper)	Aquatic vegetation (lower/upper), terrestrial vegetation (upper); undercut banks/bedrock ledges (upper) and sm. woody debris (upper)

**NOJOQUI CREEK  
PERCENT HABITAT TYPE  
(linear feet)**



#### Temperature Data

Year	Ave. Daily Mean	Days Exceed 20 °C	Daily Max.	Days Exceed 25 °C
1997	<19	0	<19	0
1998	17.8	84	27.0	33
1999	17.1	5	25.4	1

Unknown monitoring period in 1997; 1998 monitoring includes January-February and mid-May to November; 1999 monitoring April to mid-August

**Figure 2-6 Summary of Nojoqui Creek Habitat Attributes**

### 2.3.6 SALSIPUEDES CREEK AND EL JARO CREEK

#### 2.3.6.1 General Location and Description

The Salsipuedes-El Jaro Creek system is the largest tributary drainage in the lower basin. Salsipuedes joins the Santa Ynez River just upstream of the town of Lompoc. El Jaro Creek is a tributary of Salsipuedes Creek. The Salsipuedes-El Jaro Creek watershed area is approximately 47 square miles. Salsipuedes Creek is approximately 9 miles long, and El Jaro Creek is approximately 12.5 miles long. The stream gradient of lower Salsipuedes Creek and El Jaro Creek is relatively low, while upper Salsipuedes is moderately high gradient. Figure 2-7 provides a summary of Salsipuedes-El Jaro Creek habitat quality and fish utilization attributes. This system is the second tributary that returning steelhead encounter after entering the Santa Ynez River from the ocean, and the first into which they can migrate.

Access to habitat within Salsipuedes and El Jaro creeks by anadromous steelhead may be limited by low-flow passage impediments associated with bridges or road crossings (S. Engblom, pers. comm., 1999). Recent surveys by the SYRTAC biologist documented two impediments (S. Engblom, pers. comm., 1999), although an earlier survey reported three low-flow passage impediments (SYRTAC 1994, 1997). These impediments are thought to impede the passage of both adult and juvenile fish primarily during periods of low flow. The Highway 1 Bridge #51-95 on lower Salsipuedes Creek is located approximately 3.6 miles upstream from the Santa Ynez River. This bridge has a 3- to 4-foot drop from the concrete apron into a pool downstream of the bridge. Pool depth may not be sufficient to allow fish to negotiate the apron. Another impediment is a road crossing and concrete apron on El Jaro Creek about 1/3 of a mile upstream of the confluence with Salsipuedes Creek. It is an old ford on a private, unused road, with a 3-foot drop below.

Habitat surveys were conducted by the SYRTAC in 1994, 1996 and 1998 (SYRTAC 1997, 1998). Lower Salsipuedes Creek (below the confluence with El Jaro Creek) was surveyed on June 12 and 13, 1996, at a flow of 2.06 cfs. The habitat was comprised primarily of shallow runs (72% of surveyed reach length), with some deep run (7%), step run (5%), pools (10%), and riffles (6%) (SYRTAC 1998). After the first quarter mile, the flood plain widened, and there was minimal riparian vegetation and canopy (SYRTAC 1997). Canopy cover in 1996 averaged 24% for riffles and 16% for pools, but was less than 10% for all runs. Riparian vegetation was scoured from the main channel in the winters of 1995 and 1998 (S. Engblom, pers. comm.). Several small pools with undercut banks and other features provide important summer habitat for rainbow trout/steelhead (SYRTAC 1997). Instream cover averaged 34% in pools (vegetation, bedrock, some woody debris), 28% in deep runs (vegetation, bedrock, undercut banks), 18% in runs (vegetation with some bedrock and undercut banks), and 13% in riffles (mainly white water) (SYRTAC 1998). Following the heavy winter flows of 1998, a survey on June 22 and June 29, 1998 at a flow of about 10 cfs found mostly runs and slightly less pools (73% runs, 15% glides, 7% riffles, and 4% pools) (SYRTAC data).

## QUICK FACTS

### Salsipuedes & El Jaro Creeks

**Number of *O. mykiss* Observed (1995-1999)**

**Present to Common** (703 in 1995-1999 surveys- 211 YOY [many present but not sampled], 399 JUV, 93 ADULT; trapping yielded 77 U/S migrants and 46 D/S migrants -lower Salsipuedes Ck. only)

**Estimated Watershed Area**

**47.1 sq. mi.**

**Estimated Stream Length**

**21.5 miles** (Lower Salsipuedes-4 mi., Upper Salsipuedes-5 mi., El Jaro-12.5 mi.)

**Estimated Stream Gradient**

**LOW** (Lower Salsipuedes-0.3%, Upper Salsipuedes-3.3%, El Jaro-1.3%)

**Percent Canopy (Avg)**

**1 to 25** (Range: 0 to 50)

**Total Distance Habitat Typed (ft)**

**23,490**

## Summary of Habitat Attributes Salsipuedes & El Jaro Creeks

	Pool	Riffle	Run	Glide
<b>Quantity</b>	19	31	43	14
<b>Distance (ft)</b>	905	2278	16995	3312
<b>Distance (%)</b>	3.9	9.7	72.3	14.1
<b>Avg Depth (ft)</b>	2.2	0.9	1.2	1.1
<b>Avg Max. Depth (ft)</b>	4.6	2.5	3	3.3
<b>Avg Instream Shelter (%)</b>	25 to 50	50 to 75	25 to 75	0 to 50
<b>Avg Canopy (%)</b>	0 to 25	25	25	25
<b>Annual Fish Quantity (Avg)</b>	128.3	12	82.3	2.3
<b>Dominant Shelter Components</b>	Undercut banks, bedrock ledges, boulders, aquatic vegetation, whitewater, sm. woody debris, terrestrial vegetation	Whitewater, boulders, aquatic vegetation, terrestrial vegetation, bedrock ledges	Aquatic vegetation, undercut banks/bedrock ledges, boulders, terrestrial vegetation, sm. woody debris	Aquatic vegetation, undercut banks/bedrock ledges, terrestrial vegetation, sm. woody debris

### Temperature Data

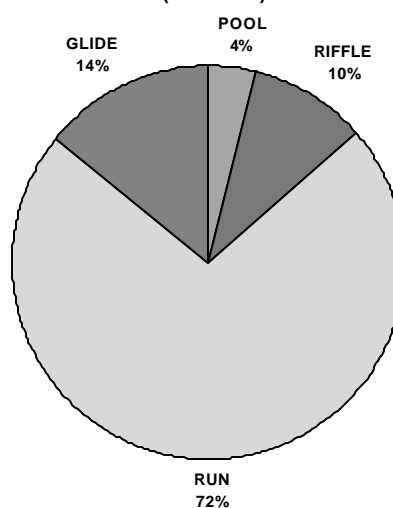
Year	Ave. Daily Mean	Days Exceed 20°C	Daily Max.	Days Exceed 25°C
<b>Lower Salsipuedes Creek</b>				
1996	19.3	76	27.6	53
1997	16.0	87	27.4	24
1998	18.4	79	39.4	78
1999	16.8	52	34.4	48
<b>Upper Salsipuedes Creek</b>				
1996	14.2	0	21.6	0
1997	14.5	0	22.8	0
1998	15.2	14	27.3	2
1999	15.6	2	30.7	2
<b>El Jaro Creek</b>				
1996	20.0	83	28.1	27
1997	16.1	45	26.5	9
1998	16.5	74	27.7	40
1999	17.4	23	28.8	22

*Lower Salsipuedes*- monitoring conducted in 1996 (May-October), 1997 (January-June; mid-August thru December), 1998 (early January; mid-April to November), 1999 (February to November).

*Upper Salsipuedes* monitoring conducted in 1996 (May-June; November-December), 1997 (January-December), 1998 (January-October), 1999 (April-October).

*El Jaro* monitoring conducted in 1996 (May to November), 1997 (early January ; mid-February thru December), 1998 (January to November), 1999 (April to November).

**SALSIPUEDES & EL JARO CREEKS  
PERCENT HABITAT TYPE  
(linear feet)**



**Figure 2-7 Summary of Salsipuedes Creek and El Jaro Creek Habitat Attributes**

Substrate conditions varied by habitat in 1996, with silty conditions generally throughout lower Salsipuedes Creek. Pools were dominated by fine sediments, and sub-dominated by bedrock and gravels. Riffles were dominated by small cobbles, and sub-dominated by gravels and large cobbles. Run habitats were dominated by gravels and fine sediments, and sub-dominated by small cobbles.

In 1994, seven habitat units were identified and measured in upper Salsipuedes Creek, directly upstream of the confluence of El Jaro Creek. The habitat units surveyed included 4 pools, 2 riffles, and 1 run, covering a distance of approximately 500 feet, where access issues limited the extent of the survey. Excellent cover and shading were observed in the 1994 survey, and suitable spawning gravels were observed in all riffle and pool tail areas. A survey conducted June 26, 1996 found that habitat was comprised mainly of runs (44% by length), followed by step runs (27%), pools (20%), and riffles (9%). Flow was .68 cfs in upper Salsipuedes and 2 cfs in lower Salsipuedes on that day. Canopy coverage was relatively high compared to lower Salsipuedes and El Jaro creeks, averaging 48% in riffles, 29% in pools, 17% in runs, and 13% in step runs (SYRTAC 1998). Instream cover was 38 to 40% for all habitat types. Substrate composition was also similar across habitat types, with gravels dominant, and in pools and runs fine sediments subdominant.

The banks and channel in El Jaro Creek are very similar to lower Salsipuedes, although El Jaro has two to three times the flow of upper Salsipuedes. The 1994 survey near the confluence with Salsipuedes Creek documented large pools, good riparian cover with overhanging vegetation, good instream cover in the form of vegetation and boulders, and generally excellent trout habitat (SYRTAC 1997). Further upstream there were areas of marginal habitat with abundant fine sediment, slow flow, and medium canopy. Other sections had high gradient riffles, very rocky substrate, and appeared to provide quality trout habitat. Although some reaches upstream of the ford had excellent spawning and rearing habitat, no trout were observed in the stream for 2 miles. A greater incidence of destabilized banks and fine sediments were observed in the upstream portion of El Jaro Creek and in the lower section of Salsipuedes Creek.

El Jaro Creek was surveyed again on June 27, 1996 at a flow of 1.1 cfs. The survey (4,490 feet total) found primarily runs (61% by length), with lower proportions of pools (17%), step runs (13%), riffles (6%), and deep runs (3%) (SYRTAC 1998). Canopy cover averaged 26% in pools, 28% in riffles, 23% in deep runs, and only 5% in runs. Instream cover was greatest in pools (32%, vegetation and boulders), followed by runs (26%, vegetation and boulders), deep runs (15%, boulders and rootwads), and riffles (22%, vegetation, rootwads, and boulders). Substrate in pools and deep runs were dominated by fine sediments and sub-dominated by boulders and gravels. Riffles and runs were dominated by gravels, and sub-dominated by cobbles in riffles and fine sediments and large cobbles in runs. Following the heavy winter flows of 1998, a survey in July 1998 (4,548 feet total) at a flow of 5.9 cfs found more riffles and fewer pools (66% runs, 19% riffles, 12% glides, and 3% pools) (SYRTAC data). The large

storms of 1995 and 1998 have altered this reach by filling in some pool habitat and scouring riparian vegetation.

Overall, the reaches with the best conditions are in upper Salsipuedes Creek (upstream of the confluence of the two creeks). All three creeks are steeply banked with a confined channel. Casual observations by the SYRTAC biologist suggest that habitat conditions are fairly consistent throughout the entire system (S. Engblom, pers. comm.).

### **2.3.6.2 Fish Use**

Rainbow trout/steelhead of all size classes have been found in the Salsipuedes-El Jaro Creek system. During summer months when conditions are warm, typically they are found in pools and deep runs. Arroyo chub, fathead minnow, and threespine stickleback were common throughout. Lower Salsipuedes also had warmwater species such as green sunfish, largemouth bass, and bullhead.

In March 1987, an electrofishing survey by U.S. Fish and Wildlife Service (USFWS) collected two adult females and two adult males (Harper and Kaufman 1988). Of these adults, only one female appeared to have been an ocean resident. Captured juveniles did not exhibit smolting characteristics, although several juveniles observed from the bank appeared to be smolts (Harper and Kaufman 1988).

In 1994, an electrofishing survey in May and August found young-of-the-year and juvenile rainbow trout/steelhead around the confluence of Salsipuedes and El Jaro, and one adult larger than 250 mm was found in Salsipuedes upstream of the confluence (SYRTAC 1997). In 1997, snorkel surveys in lower Salsipuedes found young-of-the-year (33), juveniles (172), and small adults (16), while surveys in upper Salsipuedes and El Jaro found young-of-the-year (56 in upper Salsipuedes, 45 in El Jaro) as well as juveniles and adults (10 in upper Salsipuedes, 62 in El Jaro) (SYRTAC 1998).

The results of seasonal migrant trapping on Salsipuedes Creek in 1997 are summarized in Figure 2-8. In 1997, an average rainfall year, 34 upstream migrants and 12 downstream migrants were captured. The fish tended to be small but mature fish (125 mm to 256 mm) that are likely resident rainbow trout possibly reared in the lagoon, and a few large adults (345 mm to 580 mm) that could be anadromous steelhead from the ocean. In 1998, only one upstream migrant was captured, while 40 migrants were captured in 1999. Observations of spawning in wet years such as 1995 and 1998 were limited due to the difficulty of trapping when flows were high and turbid. Spawning has been documented in both streams (SYRTAC 1997). In 1997, redd surveys found most redds just above the confluence (within a 1/2 mile) in El Jaro (18 redds) and upper Salsipuedes (11 redds), with 14 redds also located on lower Salsipuedes Creek within 2 miles downstream of the confluence with El Jaro (Figure 2-9). In 1998 and 1999 redd surveys were conducted in Salsipuedes and El Jaro creeks. Three redds were observed in Salsipuedes Creek in 1998 (upper only), while 64 redds were observed in 1999

(48 lower, 16 upper). No redds were observed in El Jaro Creek during surveys conducted in 1998 and 1999.

Downstream migrant trapping in Salsipuedes Creek indicates that most movement occurs in March and April. In 1994, five fish were captured in June, but none appeared to be smolts (SYRTAC 1997). In 1996, four fish were captured between February and April, and two of them (131 mm and 153 mm) had smolting characteristics. In 1997, nine fish (148 mm to 240 mm) were captured between February and April. Four of these were smolting. Trapping conducted in 1998 and 1999 yielded 23 downstream migrants (17 and 6, respectively).

For additional data, please refer to SYRTAC data compilation reports (1998 and 2000).

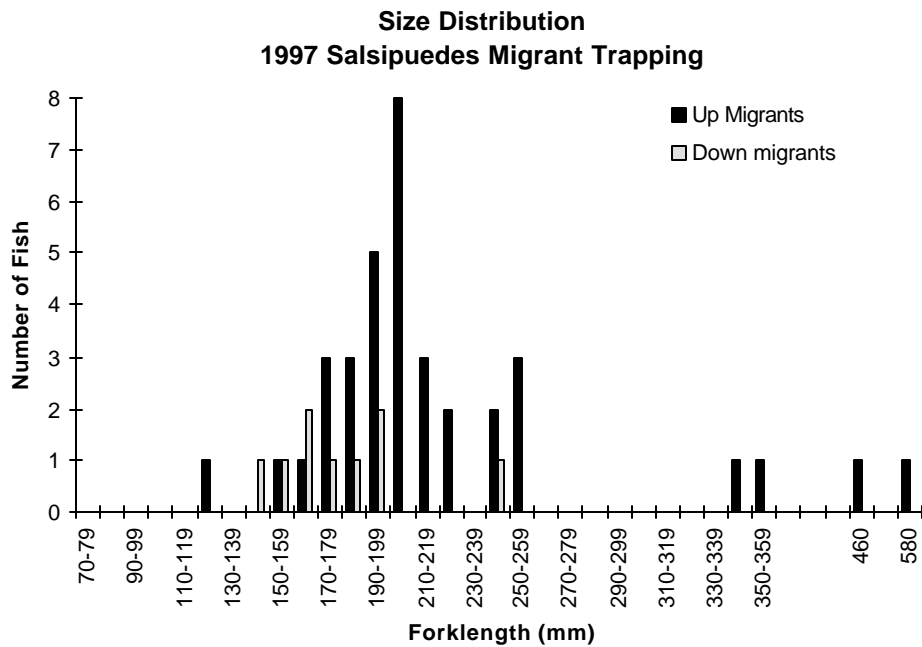
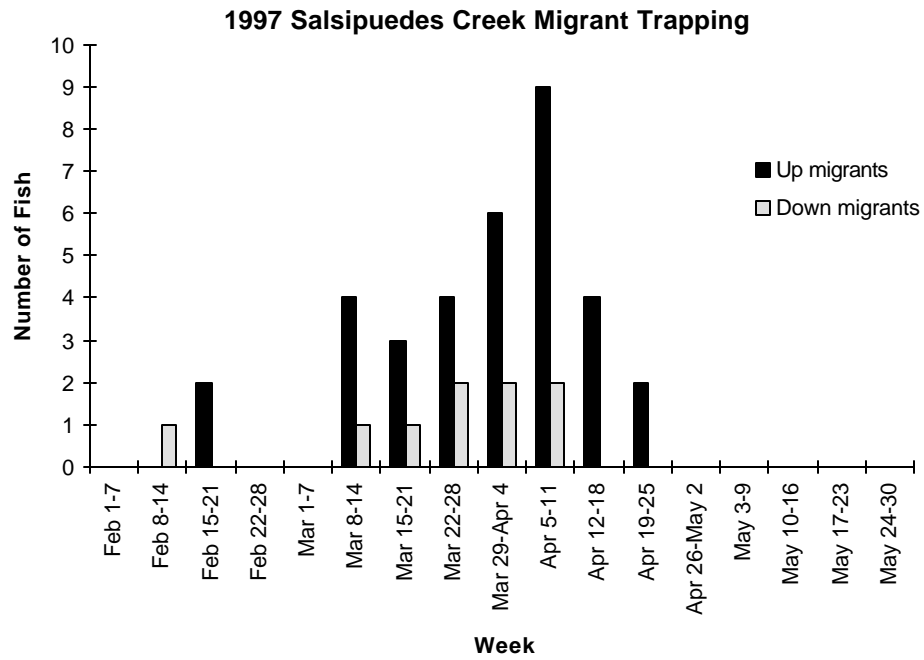
### **2.3.6.3 Water Quality**

Maximum water temperatures in upper Salsipuedes Creek (upstream of the confluence of El Jaro Creek) were monitored periodically from 1995 to 1998. Water temperature was 2 to 3°C cooler in this portion of the stream than in El Jaro Creek or in lower Salsipuedes Creek. Water temperatures did not exceed 22°C in either 1995 or 1996, nor did average daily temperatures exceed 19°C.

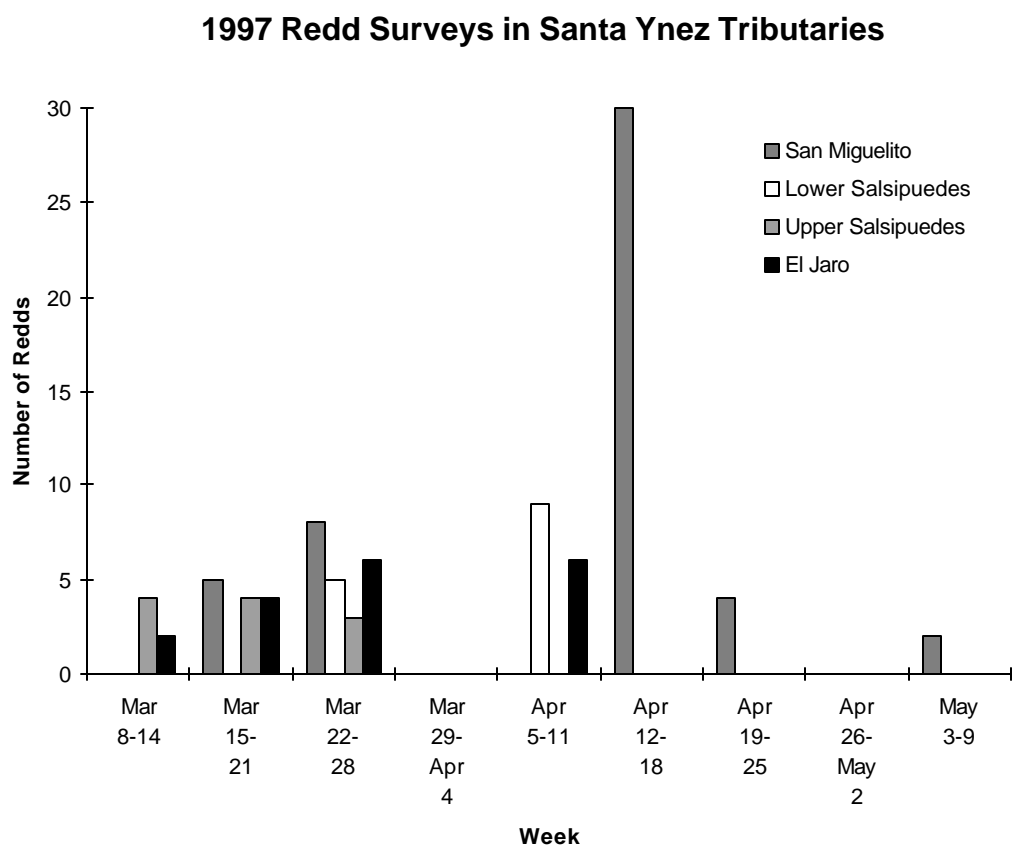
Water temperatures in El Jaro Creek, just upstream of its confluence with Salsipuedes Creek and in lower Salsipuedes Creek, were relatively higher than in the upper Salsipuedes. Mean daily temperatures at both locations exceeded 20°C in July and August 1995, and maximum temperatures exceeded 24°C in these months as well. Temperature regimes are almost identical in both El Jaro and lower Salsipuedes creeks.

### **2.3.6.4 Enhancement Potential**

Although this watershed has a generally low gradient, the enhancement potential is high for Salsipuedes and El Jaro creeks, given the availability of year-round water and the presence of rainbow trout/steelhead. Improving canopy cover, increasing the number of pools, and reducing sedimentation in certain areas, especially lower Salsipuedes near the confluence of the two creeks, could reduce water temperatures and improve substrate conditions. Passage impediments also could be modified. Enhancement of the Salsipuedes–El Jaro Creek system was considered to be a higher priority for habitat enhancement. Impediment modification and habitat enhancement measures (Ranking No. 2) on El Jaro, lower Salsipuedes, and upper Salsipuedes are considered important to steelhead utilizing the lower Santa Ynez River, since fish utilization there is ongoing, and opportunities for habitat enhancement on private property are likely. The Salsipuedes–El Jaro system is also considered to be very important to steelhead during drier years since Salsipuedes is the closest viable stream for upstream migration and spawning. The mainstem Santa Ynez, above the Salsipuedes confluence, may not support passable streamflow during low-flow years.



**Figure 2-8 Results of Seasonal Migrant Trapping in Salsipuedes Creek (1997)**



**Figure 2-9** Timing of Rainbow Trout/Steelhead Spawning from Redd Surveys in Salsipuedes, El Jaro and San Miguelito Creeks (1997)

### 2.3.7 SAN MIGUELITO CREEK

#### 2.3.7.1 General Location and Description

San Miguelito Creek flows into the Santa Ynez River at the City of Lompoc. San Miguelito Creek is estimated to be 9 miles long, and the watershed area is approximately 11.6 square miles. The lower reach of San Miguelito Creek near Lompoc is low gradient. The stream gradient in the upper reaches is relatively high. Figure 2-10 provides a summary of San Miguelito Creek habitat quality and fish utilization attributes. The lower 2 miles of San Miguelito Creek is a concrete box culvert with several drop structures. This impedes fish passage at low flows due to shallow depth and at high flows due to high velocities. The culvert empties into the Santa Ynez River near V Street in Lompoc. The creek above this culvert has a narrow channel with well-developed riparian corridor and adequate spawning habitat. Other passage barriers exist, such as a bridge with a 30-foot concrete apron downstream that slopes to a 9-foot drop where the creek has downcut below the concrete.

#### 2.3.7.2 Fish Use

Passage from the Santa Ynez River is completely blocked by the concrete culvert, drop structures and other barriers, such as a bridge with a long concrete apron that is raised 4 feet above the downcut channel. Resident rainbow trout spawn and rear in the upper creek. Young-of-the-year rainbow trout and adults were relatively abundant near San Miguelito Park (about 3 miles upstream of Lompoc) in 1996 surveys (SYRTAC 1997). Spawning surveys began in 1997 and found 49 redds. In 1998, one redd was observed, while 35 redds were observed in 1999. Although upstream passage by steelhead from the ocean is currently impossible, a fish moving downstream was captured in April 1997. Downstream migrating fish captured did not exhibit smolting characteristics. Migrant trapping in 1998 and 1999 yielded only one downstream migrant in 1999.

#### 2.3.7.3 Water Quality

Water temperature has been monitored since 1997. Water temperature conditions appear to be good through the summer, due to good canopy coverage and proximity to the ocean. Perennial flow persists in the stream near the county park.

#### 2.3.7.4 Enhancement Potential

Providing access to the upper creek is the primary enhancement necessary. However, modification of the flood control channel would require considerable work (the feasibility of such an undertaking has not been investigated). Since passage through or around the flood control channel on lower San Miguelito Creek cannot be successfully completed without substantial modifications (*i.e.*, channel removal), the enhancement actions were ranked for lower priority (Ranking No. 6). Although the habitat and fish utilization upstream of these barriers is relatively good, the probability of providing adequate passage upstream is low.

## QUICK FACTS

### San Miguelito Creek

Number of *O. mykiss* Observed (1995-1999)

**Present to Common** (Based on bank observations. No sampling conducted in 1995-1999: trapping in 1997 and 1999 yielded 4 D/S migrants.)

Estimated Watershed Area

**11.6 sq. mi.**

Estimated Stream Length

**9 miles**

Estimated Stream Gradient

**MODERATE** (Lower-0.9%, Middle-1.9%, Upper-4.9%)

Estimated Canopy

**GOOD** (above lower 3 mi.-concrete flood control channel)

Total Distance Habitat Typed (ft)

**0** (not habitat typed)

## Summary of Habitat Attributes

### San Miguelito Creek

- Upper portion of San Miguelito Ck. may have been stocked by CDFG in the past.
- Lower 2 miles from the confluence is concrete box culvert with several drop structures and considered impassable
- Above the culvert there are additional passage barriers and drop structures.
- Resident rainbow trout spawn and rear in the upper creek and have been observed to be relatively abundant.
- Spawning and rearing habitat is fair to good above the passage barriers.
- Estimated that 70% is run habitat with good canopy and instream shelter complexity.

### SAN MIGUELITO CREEK PERCENT HABITAT TYPE (linear feet)

#### Temperature Data

Year	Ave. Daily Mean	Days Exceed 20 °C	Daily Max.	Days Exceed 25 °C
1997	16.0	57	25.6	12
1998	15.1	0	21.5	0
1999	15.1	2	28.2	1

Monitoring conducted in 1997 (March-July, & December), 1998 (March-July, & September to November) and 1999 (April to November).

**No Quantitative Data Available**

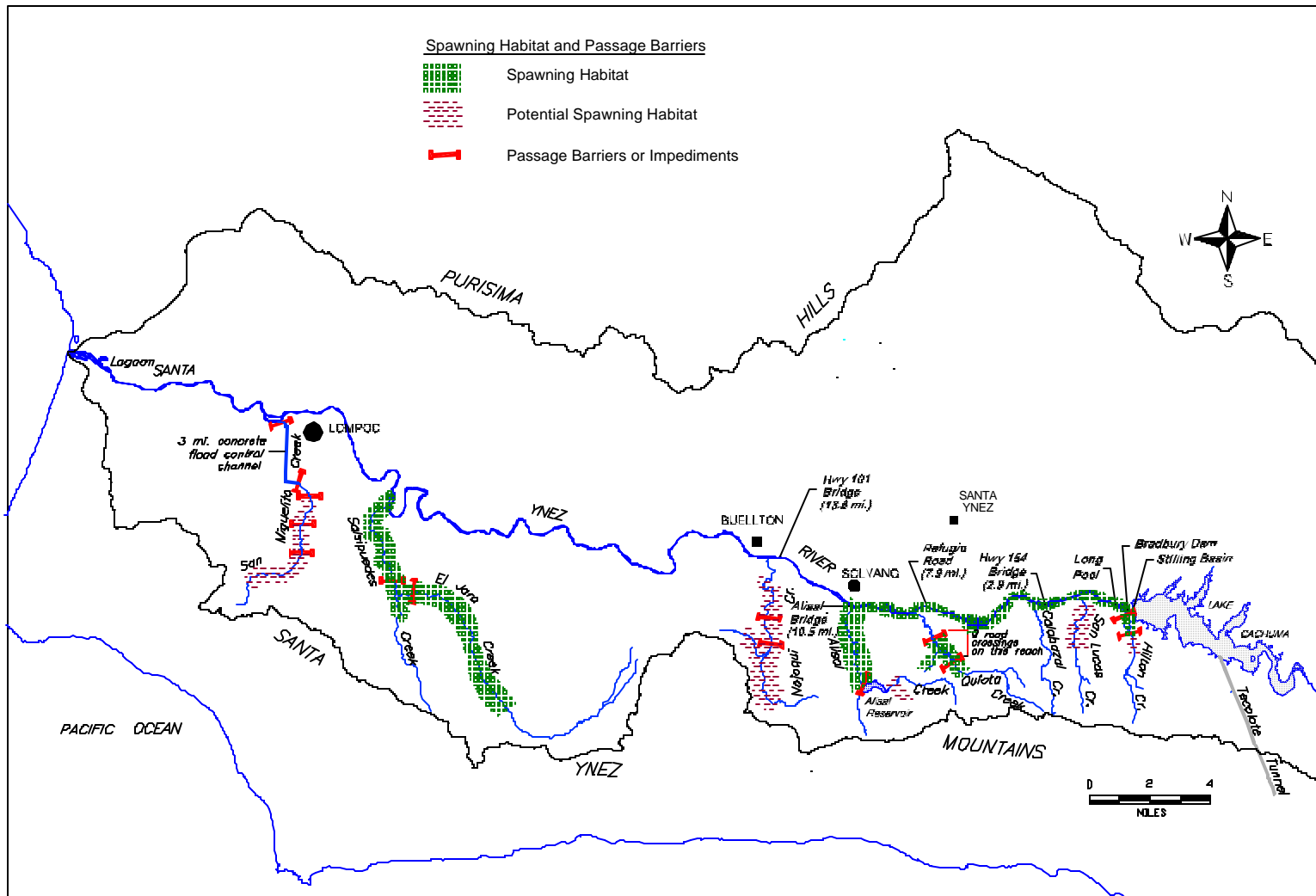
**Figure 2-10 Summary of San Miguelito Creek Habitat Attributes**

## 2.4 SUMMARY

The available data from studies of accessible tributary reaches were used to estimate potential spawning and rearing habitat for rainbow trout/steelhead in the lower basin (Figures 2-11 and 2-12). Habitat quality can vary annually depending on rainfall. In wet years, habitat quality is improved and good conditions persist further down the tributaries and close to the mainstem. It is worth noting that these assessments are based on studies conducted during a relatively wet period for the Santa Ynez River.

Good spawning habitat for rainbow trout/steelhead can be found in Hilton Creek and mid-to-upper Quiota Creek (Figure 2-11). Spawning habitat in Salsipuedes and El Jaro creeks is moderate, due to the presence of fine sediments and sands in the stream, with some areas of good habitat. Good habitat exists above passage impediments in San Miguelito and upper Alisal creeks. Stream reaches where young-of-the-year have been observed suggests that spawning habitat exists in those areas.

Successful over-summering of juvenile rainbow trout/steelhead has been observed in lower Hilton Creek, Quiota Creek, Alisal Creek, Salsipuedes Creek (upper and lower), El Jaro Creek, and San Miguelito Creek. Good quality summer rearing habitat can be found in upper Salsipuedes, upper Quiota, and lower Hilton creeks when flow is present (Figure 2-12). Fair to good habitat exists above passage impediments in San Miguelito and upper Alisal creeks. Fair conditions are found on lower Salsipuedes, El Jaro, and the mainstem (Refugio and Alisal reaches). Poor conditions exist on the lower reaches of most creeks (within about 1 to 2 miles of the confluence with the mainstem). While Nojoqui Creek appears to have some good habitat elements, the lack of fish suggests otherwise.



**Figure 2-11 Potential Spawning Habitat for Rainbow Trout/Steelhead in the Lower Santa Ynez River**



The stated objectives of the Tributaries Work Group are to protect good quality habitat and enhance fish passage at identified impediments. Habitat protection and stream habitat enhancement can be achieved through the implementation of land and habitat conservation measures. Where structures impede or prevent fish migration, modifications will enhance passage and provide greater opportunities for upstream migrating steelhead to reach their spawning grounds. Conservation measures and impediment modifications are described in greater detail in the sections that follow.

### **3.1 HABITAT CONSERVATION MEASURES**

#### **3.1.1 OBJECTIVE**

The objective is to protect existing good habitat and improve habitat through enhancement actions to benefit rainbow trout/steelhead. Since much of the tributary habitat is on private lands, establishment of conservation agreements or voluntary joint actions with landowners will be needed.

#### **3.1.2 PROJECT DESCRIPTION**

In the tributaries on the south side of the watershed, habitat quality can range from good quality in upper reaches (*i.e.*, perennial flow, good canopy cover, suitable water quality) to poor just above the confluence with the mainstem Santa Ynez River (*i.e.*, intermittent or no flow in summer and little canopy cover). Conservation measures directed at tributary habitat will focus on protecting habitat that is already in good condition and enhancing habitat that is in fair condition. Efforts will not be expended on poor quality habitat where conditions cannot be feasibly improved.

All tributaries in the lower basin, except lower Hilton Creek, are on private property. Therefore, voluntary participation by the landowner is necessary to implement protection and enhancement measures along these streams. Conservation actions can take one of several approaches, including (1) creation of a conservation management plan through the Natural Resources Conservation Service (NRCS), the USFWS or other agencies, (2) creating a partnership with the Adaptive Management Committee to conduct restoration activities, and/or (3) the acquisition of conservation easements or leases. With the conservation easement/lease approach, the Adaptive Management Committee will obtain the easements/leases from landowners to protect property and to implement and monitor appropriate enhancement actions. Priority areas for seeking conservation easements and/or leases will be identified according to the persistence of flows, suitability of habitat (or potential for enhancement), and absence of downstream passage impediments.

This section outlines the conservation management and conservation easement process and describes potential enhancement activities. We also assess the environmental impacts expected for steelhead and other sensitive and protected species.

### **3.1.2.1 Conservation Management Practices and Landowner Education**

Stream enhancement measures can be complemented by habitat protection through conservation practices and educating landowners about “fish friendly” land management practices.

The U.S. Department of Agriculture NRCS has a fifty year history of working in the Santa Ynez watershed and assisting private landowners in applying conservation practices. The service offers consulting to landowners on conservation management practices and has a variety of voluntary cost-share programs to help offset the cost of implementing conservation management plans. Many of these practices would equally benefit land management, stream protection and enhancement for fish habitat. Examples include:

- erosion control
- appropriate fencing
- fish stream improvement
- fish pond management
- riparian forest buffers
- streambank protection
- stream channel stabilization
- vegetative buffer strips

Such actions are initiated by the landowner and are addressed directly to the NRCS office in Santa Maria.

The USFWS also administers several grant programs, including the *Partners for Fish & Wildlife* program, which are designed to benefit landowners while protecting sensitive habitat. As with the NRCS programs, interested landowners apply directly to USFWS for grant information and assistance.

NMFS and USFWS can enter ‘Safe Harbor’ agreements with private landowners. The agreements benefit endangered and threatened species while giving the landowners assurances from additional, future restrictions based on the landowner’s conservation actions. Interested landowners would apply to NMFS, for steelhead, and to USFWS for other listed plants and wildlife.

In addition to the services offered by federal agencies, the SYRTAC proposes offering literature and a series of public workshops designed to provide the public with an understanding of the importance of improving habitat conditions and steelhead use in the lower Santa Ynez River. These efforts will demonstrate ways in which the protection of fish habitat can be mutually beneficial to the landowner as well as to critical fish habitat. We will also solicit voluntary participation from private landowners and the public in restoration and protection activities.

Public outreach and education is discussed in greater detail in the main section of the Fish Management Plan.

### **3.1.2.2 Conservation Easements and Leases**

Results of fisheries investigations performed by the SYRTAC (1997, 1998, 2000) have shown that habitat conditions are suitable for steelhead spawning and/or rearing within a number of tributaries in the lower watershed. Habitat conditions within these tributaries, however, could be enhanced and improved for steelhead. Although, because these tributaries are in private ownership, steps must be taken to gain access to these lands in order to implement enhancement measures. Conservation easements and leases allow for protection of habitat and may grant access for additional enhancement activities while providing benefits to landowners.

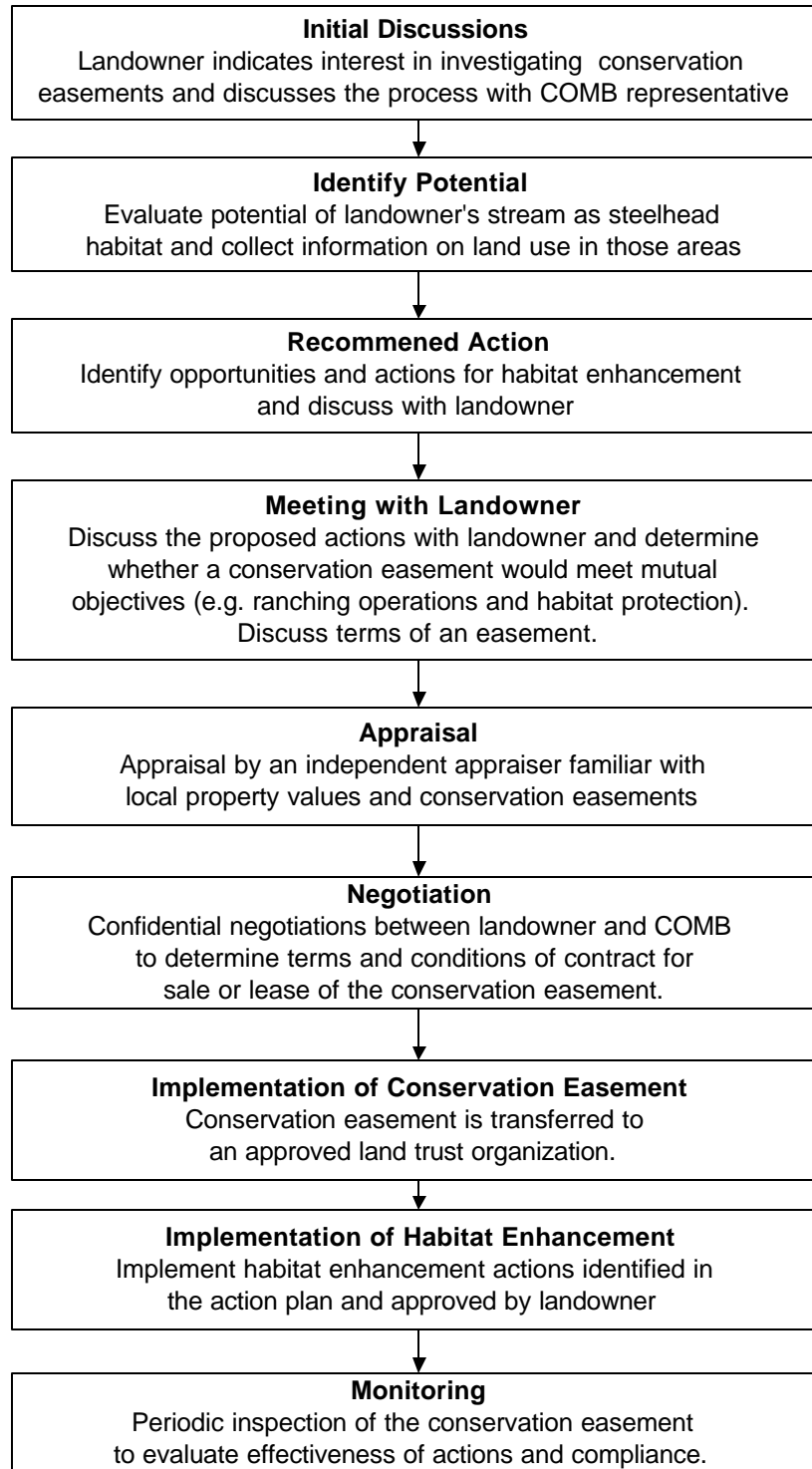
Habitat protection will focus on obtaining conservation easements or long-term leases from private landowners along tributary corridors. A conservation easement is a legal agreement between a landowner and a non-profit group or government agency, such as the Santa Barbara Land Trust or the Cachuma Operation and Maintenance Board (COMB). Conservation easements entail purchasing the rights to manage a strip of property along streams from the property owner. The owner retains ownership of the property, but is paid for loss of use. In many cases, the owner can realize tax and estate planning benefits from the easement. In exchange, the Adaptive Management Committee would be able to implement fish conservation measures within the easement. Conservation leases are similar to the easements, however, a lease is acquired for a specific time period. For the purpose of this program, only long-term (10- to 20-year) leases will be considered for habitat enhancement protection and projects. Hereafter, the description of conservation easements also applies to the lease agreements.

Conservation easements can be effective at fostering habitat improvement both where land use is negatively affecting riparian and aquatic habitat and/or where the stream characteristics provide opportunities for enhancement. Conservation easements can foster natural recovery of habitat over time, as well as enhance the success of active intervention through other actions, such as planting riparian vegetation.

The Adaptive Management Committee will work with landowners to develop erosion control measures and/or land use practices that protect steelhead and their habitat without adversely affecting the operation of the landowners' property. Such practices may include livestock management, creation of catchment ponds to settle fine sediments and other materials from runoff waters before they enter the stream, streambank protection, vegetative buffer strips, and upland erosion control measures.

The general process for establishing conservation easements starts with discussions between the landowner and COMB (Figure 3-1). Potential actions and evaluation of benefits, such as collecting information to evaluate the stream as steelhead habitat, and assessing opportunities to improve habitat, will be discussed with the landowner. An independent appraiser familiar with assessing property values for conservation easements

## CONSERVATION EASEMENT PROCESS



**Figure 3-1 Conservation Easement Process**

will do an appraisal. The landowner and COMB determine the terms and conditions for sale or lease of the conservation easement. After the easement is established, the Adaptive Management Committee would then implement the habitat enhancement actions identified and monitor improvements to appropriately manage the conservation easement. Each step in this process is completely voluntary, and the landowner reserves the right to bow out at any point up to the purchase of the easement.

In addition to protecting and improving habitat for endangered steelhead, the conservation easements and associated habitat enhancement measures will also benefit other protected species. The California red-legged frog is known to inhabit Salsipuedes Creek. This species occurs in the stream corridor and prefers dense riparian vegetation. The conservation easements will therefore also protect and enhance frog habitat. Other fish inhabiting the protected and enhanced reaches will likewise benefit from these actions.

Several landowners have approached the SYRTAC in regards to establishing conservation easements. The public education and outreach program will complement this action by educating landowners about “fish friendly” land management practices and encouraging others to participate in conservation easements.

### **3.1.2.3 Physical Enhancement Measures**

#### **3.1.2.3.1 Structural Modification of Instream Habitat**

Habitat improvements would include structural modifications to instream habitat such as the creation of additional pool and riffle areas and augmentation of spawning gravel. Boulders and large woody debris would be used to create additional habitat features within selected reaches of the mainstem and the tributaries. Access to private lands and the results of field fisheries surveys and habitat typing, in combination with results of water temperature monitoring, will be used as a basis for identifying specific locations for habitat protection and improvement.

#### **3.1.2.3.2 Addition of Instream Structures**

Physical modifications of the channel through the addition of instream structures would be used to create more over-summering pool habitat. Habitat complexity has been positively correlated with fish density. Methods for physical enhancement include: (1) improving the quality of pools by increasing cover and complexity, and (2) increasing the amount of pool habitat by increasing depths in existing pools or scouring new pools.

The first step of a pool enhancement program would be to identify areas where opportunities exist for enhancement measures to be successfully implemented. Surveys would be conducted of existing permanent pools to determine their habitat characteristics, as well as to identify additional areas where pools could be created that would likely persist. Site selection would take into account accessibility, channel hydraulics, geomorphology (*e.g.*, bankfull width, depth, gradient, sinuosity, sediment load, and substrate size), streamflow regime, and availability of

structural materials. Sites with relatively stable streambed, stable banks, and woody riparian vegetation will afford the greatest opportunities, while sites with steep streambanks, non-cohesive sandy soils, little riparian vegetation, and high stream gradients present greater challenges to the successful use of instream structures.

Once suitable sites have been identified, a conceptual enhancement plan can be developed. A feasibility analysis would be performed to evaluate factors such as continued site accessibility, structural stability, cost, and longevity prior to developing final engineering plans for the proposed enhancements. Although the instream habitat improvements will be designed to withstand damage due to flood flows to the maximum extent practicable, periodic maintenance will be required to correct problems such as unsuitable scouring of cover structures or infilling of pools with excess sediment.

Overhanging riparian vegetation, undercut banks, exposed root wads or logs may naturally form cover elements in pools. Structures typically added to pools to enhance cover include logs, root wads, boulders and cobbles. These structures would need to be secured to stable locations to prevent washout. Boulders and cobbles can be placed into pools to create interstitial spaces that provide cover. Consideration should be given to using boulders and cobbles that are large enough to minimize entrainment and transport during high flows. This may require somewhat larger bed materials than those that are currently found in the river.

Installing instream structures to increase scour, direct excavation, and/or manipulating channel geomorphology, can also increase pool depth. Instream structures such as log and boulder weirs, deflectors, and/or digger logs would be used to constrict the channel, increase flow velocities, and thereby scour pools. The objective is to promote self-maintaining pools and to create backwater conditions during periods of low flow.

In some areas, spawning habitat may be enhanced or increased through addition of suitable gravel to the stream.

#### 3.1.2.3.3 Riparian Enhancement

Riparian zones perform a number of vital functions that affect the quality of aquatic habitats, as well as provide habitat for terrestrial plants and animals (Spence *et al.*, 1996). Fallen leaves and branches are an important source of food for aquatic macroinvertebrates and nutrients for aquatic vegetation, while fallen terrestrial insects are valuable prey for fish. The roots of riparian vegetation maintain bank structure and provide cover via undercut banks. Overhanging branches also provide cover. The riparian canopy can reduce water temperatures by shading the stream. Large woody debris that falls into the stream further increases cover and creates areas of scour that increase water depth. Riparian vegetation can also reduce water velocities and create refuge areas of relatively low velocity during storm flows.

Propagation of native riparian vegetation can improve stream habitat through the mechanisms described. The Plan will enhance and restore riparian vegetation at specific pools along the

Santa Ynez River and tributaries. This type of restoration effort is relatively inexpensive and easy to perform, as long as permission can be obtained from landowners to access these areas to plant vegetation or conduct other enhancement activities and to protect new plants. Planting or enhancement of riparian vegetation would be useful at sites where the canopy cover is low and the stream channel is not too wide. Where possible, deep-rooted vegetation such as sycamore or cottonwood would be preferable to shallow-rooted vegetation such as willow. The species of vegetation selected for propagation can have a measurable effect on streamflow. The enhancement or expansion of streamside vegetation will likely increase water loss due to transpiration within the stream corridor, although this would be balanced by decreases in evaporation due to improved shading.

### **3.2 PASSAGE IMPEDIMENT/BARRIER MODIFICATION**

#### **3.2.1 OBJECTIVE**

Under current conditions, man-made and natural structures may impede or prevent steelhead movements in the tributaries of the lower Santa Ynez River, especially under low and moderate streamflows. Since habitat availability may be a primary factor limiting the steelhead in the watershed, it is imperative to improve access to existing aquatic habitat by modifying or removing impediments. These efforts will serve to expand the available habitat for spawning and rearing steelhead, thereby expanding the carrying capacity of the lower river system.

#### **3.2.2 DESCRIPTION OF PHYSICAL ENVIRONMENT**

Habitat surveys conducted by the SYRTAC and others have documented passage impediments on several tributaries (Table 3-1). The tributaries of primary interest are Salsipuedes-El Jaro, Hilton, and Quiota. These creeks have perennial flow, at least in their upper reaches, and can support spawning and rearing. Passage enhancement measures for the cascade and bedrock chute in Hilton Creek and the Highway 154 Culvert are described in Appendix D. Impediments on the other tributaries are man-made structures such as road crossings, bridges, and culverts. Passage impediments on San Miguelito Creek include concrete channels, aprons and walls. Mitigating such impediments would entail significant engineering effort. Studies of the creek upstream of these impediments indicate that the habitat supports rainbow trout/steelhead and that spawning occurs in these areas.

#### **3.2.3 PROJECT DESCRIPTION**

Access to habitat within Salsipuedes and El Jaro creeks by anadromous steelhead is limited by two low-flow passage impediments, associated with bridges or road crossings (S. Engblom, pers. comm., 1999). These impediments were thought to impede the passage of both adult and

**Table 3-1      Passage Impediments on Tributaries**

<b>Creek</b>	<b>Location of Impediment</b>	<b>Structure</b>	<b>Type of Impediment</b>	<b>Jurisdiction</b>
Hilton	1,380 Feet above Santa Ynez River	Cascade and bedrock chute	High-flow passage impediment	USBR
	Below Highway 154	Concrete culvert	Velocity impediment	CalTrans
Quiota	1.3 to 1.6 Miles above Santa Ynez River and beyond	9 Road crossings	Low-flow and high-flow passage impediments	Santa Barbara County Road Department
Nojoqui	3.5 Miles upstream of Santa Ynez River	Culvert	May be an impediment	CalTrans
Alisal	2-3 Miles upstream of the Santa Ynez River	Dam and reservoir	Physical barrier	Private Landowner
Salsipuedes	3.6 Miles above Santa Ynez River	Bridge crossing on Highway 1	Low-flow passage impediment	CalTrans
El Jaro	1/3 Mile above Salsipuedes confluence	Road crossing	Low-flow passage impediment	Abandoned private road
San Miguelito	Lower 3 miles	Concrete channel	Physical impediment	County Flood Control
	3 Miles upstream of Santa Ynez River	Debris basin with 12 foot high concrete wall	Physical barrier	Unknown
	4 Miles upstream of Santa Ynez River	Small concrete ford with 4.5 foot drop	Physical impediment	Unknown
	5 Miles upstream of Santa Ynez River	Concrete apron 19 feet high with a 9 foot vertical drop	Physical barrier	Unknown

juvenile fish primarily during periods of low flow. The Highway 1 Bridge #51-95 on lower Salsipuedes Creek is located about 3.6 miles upstream from the Santa Ynez River. This bridge has a 3 to 4 foot drop from the concrete apron into a pool downstream of the bridge. Pool depth may be insufficient to allow fish to negotiate the apron. This region is frequented by poachers who can observe fish from the adjacent bridge. The SYRTAC has created preliminary designs to provide low-flow passage over the concrete apron and implementation is anticipated in the summer of 2001.

Road crossings, such as those in Quiota and El Jaro creeks, can also be an impediment to fish movement. El Jaro Creek has a road crossing and concrete apron about 1/3 mile upstream of the confluence with Salsipuedes Creek. It is an old ford on a private, unused road, with a 3-foot drop below. Refugio Road crosses Quiota Creek many times beginning approximately 1.3 miles upstream from the mainstem Santa Ynez. All nine crossings are shallow-water Arizona crossings, with concrete beds and, at several sites, a 2- to 3- foot drop downstream of the concrete apron. The County of Santa Barbara maintains Refugio Road.

Arizona crossings are typically concrete aprons placed across the streambed to permit vehicles to drive through the stream on a firm surface during periods of low or no streamflow, and permit debris and sediment to pass downstream during periods of high streamflow. Generally, these crossings require little maintenance to provide access across the stream. However, they often flatten the local stream gradient upstream, gradually developing a broad shallow channel (filled in by sediment). Downstream, an incised channel often develops (scoured by high velocity flows). Upstream migrants have difficulty swimming across the Arizona crossing due to shallow depth, or in some instances, the amount of downstream incision requires fish to jump onto the crossing.

Migration impediments associated with Arizona road crossings can be eliminated by either replacing the crossing with a small bridge or by constructing jump pools in the downstream reach. To provide low-flow passage, these road crossings can often be notched to create a low-flow channel. In addition, relatively inexpensive bridges can be made from retrofitted railroad flat cars and pre-fabricated modular bridges. In some locations large boulders can be used downstream of the crossing to construct weirs that form backwater pools which typically only hold water during periods of high streamflow. Steelhead migrating during periods of moderate to high streamflow can jump and swim between the backwater pools until they reach the crossing and swim across it. Modifying the depth of flow across these crossings would reduce their utility for vehicular use at some flow levels, making travel inconvenient. The County of Santa Barbara Public Works Department and the Adaptive Management Committee will team together to develop more fish-friendly crossings, as the County makes plans to repair several of these crossings.

Surveys of other potential passage impediments and barriers will be conducted to determine the benefits and feasibility of modifying them to enhance fish passage. For example, there is a culvert on Nojoqui Creek that may be an impediment about 3.5 miles upstream of the Santa Ynez River, but further assessment is required (S. Engblom, pers. comm., 1999). Box culverts under state and county roads can impede migration. The concrete bottom of the box culvert

forms a broad, shallow impediment during low flow and often acts to form an impediment downstream of the grade control because of a drop in the streambed elevation. Downstream, boulder weirs can often provide adequate backwater during high streamflows to drown the culvert outfall and provide passage. If site conditions prevent use of backwater weirs, then installing wooden or concrete baffles or large rocks (“roughness elements”) in the culvert can slow down the water flow through the culvert, creating a deeper flow and allowing easier fish migration. It is also possible that the culvert could be replaced with a bridge or arch culvert.

Preliminary engineering designs are in development for the low to moderate flow fish passage facilities in consultation with the bioengineering staffs of the NMFS and CDFG. The preliminary engineering designs for fish passage facilities will be used as a basis for estimating costs for final design and construction, the range of flow conditions for which the passage facilities would provide benefit, identification of permitting requirements and preparation of environmental documentation, and requirements for access to private lands for the construction of fish passage facilities.

The proposed projects will enhance passage at several fish passage impediments and barriers on principal tributaries throughout the lower watershed including Hilton, Quiota, Nojoqui, Salsipuedes, and El Jaro creeks. Passage impediment modification will provide or improve access to about 160,000 linear feet of existing tributary habitat, thus dramatically increasing the availability of spawning and rearing habitat. Construction activities associated with modifying these impediments will have temporary, negative impacts on steelhead and other fish and wildlife in the project area. Steps will be taken to minimize impacts on steelhead as discussed in the Cachuma Project Biological Opinion (NMFS 2000) and summarized in Section 4 (Implementation). These actions should also minimize the impact on other fish species. Actions to reduce impacts to other sensitive species, such as red-legged frogs and western pond turtles, will be identified through discussions with USFWS and CDFG.

#### 4.1 FUNDING

Reclamation and the Member Units are proposing to fund the conservation actions from the Cachuma Project Contract Renewal Fund and the Warren Act Trust Fund. These funds are presently administered by COMB and are overseen by the Trust and Renewal Fund Committee and the Advisory Committee. These funds were established in 1996 during the contract renewal process to provide money for enhancement and watershed improvements, and come from an assessment on water taken from the Project (\$10 per AF) and on use of the reservoir for delivery of State Water (\$43 per AF), providing \$257,000 to \$500,000 per year. The Santa Barbara County Water Agency is also required under a contract with the Member Units to provide \$100,000 annually for projects that may include conservation-type activities related to the Cachuma Project. Allocation of these funds for specific projects requires consensus by the County and Member Units, subject to public input. In the future, approximately \$300,000 per year will continue to be dedicated to rainbow trout/steelhead restoration.

In addition to these funds, Reclamation and the local water agencies are seeking funds from other sources, such as the State's Watershed Restoration and Protection Council, the CDFG's Fishery Restoration Program, the Pacific Coastal Salmonid Conservation and Recovery Initiative, the National Fish and Wildlife Foundation, the SWRCB Non-point Source Program and other sources to supplement funds available from local sources. The Member Units have been successful in obtaining outside funding for enhancement projects. Table 3-2 summarizes the outside funding for the tributary enhancement projects approved to date. In addition to seeking grant funds, the Member Units are working with CalTrans and the Santa Barbara County Roads Department to develop partnerships for implementation of the Highway 154 Culvert and Quiota Creek fish passage projects.

#### 4.2 IMPLEMENTATION

Coordination and administration of Plan activities will be performed by the Adaptive Management Committee in conjunction with federal and state agencies. Project designs will be reviewed by NMFS, CDFG, and USFWS prior to implementation (NMFS must approve the project, NMFS 2000). Currently it is estimated that the tributary enhancement measures can be completed by 2005. Should implementation take longer, then Reclamation will need to reinitiate consultation with NMFS and provide them with (1) an explanation for the delay, (2) the steps that will be taken to implement the project(s), and (3) a new anticipated completion date (NMFS 2000).

**Table 4-1      Outside Funding Approved for Tributary Enhancement Measures**

Project	Grant Program	Funding Award
Hilton Creek Cascade/Chute Fish Passage Project	CDFG's Fishery Restoration Grants Program	\$50,300
Hilton Creek Pump and Flexible Intake	National Fish and Wildlife Foundation	\$147,000
	Proposition 12 (Parks Bond)	\$230,000
El Jaro Creek Demonstration Projects (bank stabilization/ workshops)	SWRCB Non-Point Source Program	\$48,500
	Proposition 12 (Parks Bond)	\$48,500
Salsipuedes Creek Fish Passage at the Highway 1 Bridge	Environmental Enhancement and Mitigation Program	\$20,885
	Pacific Coastal Salmonid Conservation and Recovery Program	\$25,000
Conservation Easements on El Jaro Creek	Proposition 12 (Parks Bond)	\$234,000

To minimize impacts to rainbow trout/steelhead and other species during the construction phase of many of the tributary enhancement projects, NMFS has established a number of best management practices. These practices will be incorporated into the project description of each individual construction project and are presented below. The practices are taken verbatim from the Biological Opinion (NMFS 2000, Term and Condition #8):

- Reclamation, or its designated agent (here after referred to as Reclamation), shall isolate work spaces from flowing water for the purpose of avoiding heavy equipment in flowing water, sedimentation, turbidity, and direct effects to steelhead. Prior to work, sandbag cofferdams, straw bales, culverts, or visqueen (here after referred to as diversion) shall be installed to divert streamflow away or around the workspace. The diversion shall remain in place during the work, then removed immediately after work is completed.
- As a result of isolating the workspace from flowing water, Reclamation shall ensure and maintain a corridor for unimpeded passage of steelhead during work activities.
- When practical, Reclamation shall use existing ingress or egress points, or perform work from the top of creek banks, for the purpose of avoiding work and heavy equipment in flowing water and disturbing instream habitat.
- Reclamation shall photograph the work space during and immediately before and after work activities are completed for the purpose of developing a reference library of instream and riparian habitat conditions.
- Excavation of a channel for the purpose of isolating the work space from flowing water is prohibited.
- Reclamation shall minimize disturbance of riparian and upland vegetation. Using only native plant species, Reclamation shall replace vegetation affected by the work and ensure a revegetation success ratio of no less than 2:1.
- Reclamation shall revegetate soil exposed as a result of work activities using seed casting, hydroseeding, or live planting methods, no later than 30 days after the work has been completed. Only native plant species shall be used for revegetation.
- Reclamation shall inspect the revegetated area during spring and fall for two years for the purposes of qualitatively assessing growth of the plantings or seedlings and the presence of exposed soil. Reclamation shall note the presence of native and non-native vegetation and extent (percent area) of exposed soil, and photograph the revegetated area during each inspection.
- Reclamation shall prepare and implement a NMFS approved plan for restoring instream habitat and streambed within the areas affected by work activities to pre-work conditions and characteristics unless the intent of the work was to positively affect these

areas by improving habitat conditions such as by fixing passage impediments and barriers or placing cover in pools. For example, if an access route cut into a stream bank for heavy equipment cannot be avoided by the use of existing ingress, then the bank must be returned to its pre-work condition when work is completed.

- Reclamation shall retain or designate a fisheries biologist with expertise in areas of resident or anadromous salmonid biology and ecology, fish/habitat relationships, biological monitoring, and handling, collecting, and relocating salmonid species. On a daily basis Reclamation's fisheries biologist shall monitor work activities, instream habitat, and performance of sediment control/detention devices for the purpose of identifying and reconciling any condition that could adversely affect steelhead or their habitat. The fisheries biologist shall be empowered to halt work activity and to recommend measures for avoiding adverse effects to steelhead and their habitat. Reclamation's biologist shall ensure a corridor for unimpeded passage of steelhead during the work.
- Reclamation's fisheries biologist shall continuously monitor the placement and removal of any diversion needed to isolate work spaces from flowing water for the purpose of removing any steelhead that would be adversely affected. The fisheries biologist shall capture steelhead stranded in residual wetted areas as a result of streamflow diversion and workspace dewatering, and relocate the steelhead to a suitable location immediately upstream or downstream of the work area. The fisheries biologist shall note the number of steelhead observed in the affected area, the number of steelhead relocated, and the date and time of collection and relocation. One or more of the following NMFS approved methods shall be used to capture steelhead: dip net, seine, throw net, minnow trap, hand. Electrofishing is prohibited from use unless prior separate written consent is obtained from NMFS.
- Reclamation's fisheries biologist shall contact NMFS fisheries biologist Darren Brumback (562-980-4026) immediately if one or more steelhead are found dead or injured. If Darren Brumback is unavailable Reclamation shall immediately contact NMFS Protected Resources Division at 562-980-4020. If no one at Protected Resources is available, Reclamation shall immediately contact NMFS's Office of Law Enforcement at 562-980-4050. The purpose of the contact shall be to review the activities resulting in take and to determine if additional protective measures are required. Reclamation will need to supply the following information initially: The location of the carcass or injured specimen, and apparent or known cause of injury or death, and any information available regarding when the injury or death likely occurred.
- Erosion control and sediment detention devices shall be incorporated into Reclamation's work activities and implemented immediately before commencing work. These devices shall be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment (sand and smaller particles) and sediment water/slurry input to

flowing water, and of detaining sediment laden water on site. The devices shall be placed at all locations where the likelihood of sediment input exists.

- Placement of any soil/sediment berm for isolating any workspace from flowing water is prohibited.
- When dewatering any area, either a pump shall remove water to an upland disposal site, or a filtering system shall be used to collect and then return clear water to the creek for the purpose of avoiding input of sediment/water slurry to flowing water. The pump intake shall be fitted with a device to exclude all life stages of steelhead.
- Reclamation shall provide a written monitoring report to NMFS within 30 working days following completion of any work activity. The report shall include the number of steelhead killed or injured during the work activity and biological monitoring; the number and size of steelhead removed; and photographs taken before, during, and after work activity.
- Reclamation shall provide a written report to NMFS describing the results of the revegetation task within 30 working days following completion of revegetation. The report shall include a description of the locations planted or seeded, the area (m<sup>2</sup>) revegetated, a plant palette, planting or seeding methods, proposed methods to monitor and maintain the revegetated area, performance or success criteria, and pre- and post-planting color photographs of the revegetated area.
- Reclamation shall provide a written report to NMFS describing the results of the vegetation monitoring within 30 working days following completion of each fall inspection. The report shall include the color photographs taken of the work area during each inspection and before and after implementation of the work activities, and estimated percent of exposed soil remaining within each area affected by the work.

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